Department of Agriculture, C.P. and Berar

Report on its

1 Agricultural College ... 1914-15 & 1919-20

2 Botanical & Chemical Research ... 1914-15 & 1918-19

3 Central Farm ... 1914-15 & 1915-16

4 Experimental Farms ... 1914-15 & 1918-19

5 [illegible] ... 1914-15 & 1918-19

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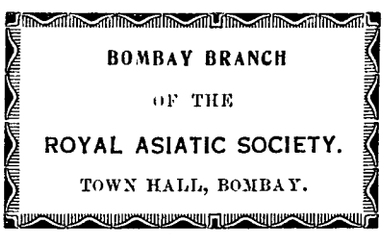

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Department of Agriculture, Central Provinces and Berar

REPORT

ON THE

1. AGRICULTURAL COLLEGE AT NAGPUR
2. BOTANICAL AND CHEMICAL RESEARCH
3. CENTRAL MUSEUM, NAGPUR
4. MAHARAJBAGH MENAGERIE, NAGPUR

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FOR

THE YEAR 1914-15

Ending the 30th June 1915

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Nagpur

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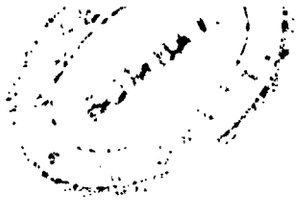

REPORT

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FOR

THE YEAR 1914-15

ENDING THE 30TH JUNE 1915.

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Report of the Agricultural College, Nagpur, 1914-15.

The Staff.

I was on combined leave from April 9th to September 18th, 1915. Mr. Plymen, Agricultural Chemist, acted for me as Principal. Mr. Phatak carried on the majority of my lecture subjects in the College course. Otherwise the staff and its work was much the same as in 1913-14. My absence on leave and the fresh calls on the time of the other European officers has placed more lecture and teaching work than usual in charge of the Indian Staff. This has been satisfactorily conducted. I am of the opinion that the Indian Staff is now in a position to conduct a good deal of the routine part of the course. The various courses, however, will require the personal supervision of the officer at the head of the section and there are certain branches which should receive the benefit of direct lectures by the head of the section. The entire relegation of all lecture work to Assistants is not conducive to the highest efficiency nor to the maintenance of the standard at this College on a par with other Educational Institutions.

Work during the Year.

Agricultural Section.

All the College were under the type of course introduced in 1912. The third year gave a large percentage of their time to Agriculture and in addition to practical lessons spent one whole day per week, engaged either in field management, cultivation work, dairy work or farm office work. The work of this year on their plots and generally on the farm has been satisfactory.

The second year has less time on the farm than in other years. They have worked fairly well, but on account of the seven weeks' break resulting from the plague epidemic failed to accomplish satisfactorily their work associated with harvesting, threshing and cleaning rabi crops. They are not a particularly promising year. The concentration on Agriculture in the present third year, which did not appear much use a year ago, has, however, made a lot of difference. The first year appears to be rather below the usual standard of intelligence. Several are, however, good workers. The enforced absence from Nagpur from January 15th to March 6th a very critical time in the course of study has had a lowering effect in the standard in all subjects.

Botany.

During the year two classes were trained in the Botanical Section. The first year class was taken entirely by Mr. Ranganath Rao while the second year class was taken by Mr. Kalka Prasad. The teaching in Botany according to the present curriculum is concentrated in two years each year having 9 hours a week. The impression gained in the first year of working on this curriculum has been confirmed, namely that frequent teaching periods tend to maintain the students' interest in the subject. Owing to an epidemic of plague the classes were closed for nearly two months in the beginning of 1915. This prolonged break in studies told very markedly on the first year students who had reached the most critical period in their course. New students are slow in settling to scientific methods of work, the first six months of the course passing without any marked external progress. The last four months are those in which the results of the preliminary training begins to show. It was at this period that the unfortunate break in studies occurred.

The first year consisted of 24 students. Of these, 3 failed in the examination at the end of the year. 11 students failed to get the necessary marks for the usual pass standard, but in consideration of the circumstances mentioned above the pass mark was reduced to 40 per cent. Only one student gained over 60 per cent. The junior students were enormously handicapped by the two months' break in their studies and this sufficiently accounts for their poor performance.

The second year consisted of 12 students who were taught by Mr. Kalka Prasad. Of these, all but one passed in the final examination, three gaining over 60 per cent of the total marks. No course in plant-breeding or mycology was possible owing to the students being away for two months.

As already pointed out the amount of time the Economic Botanist can devote to teaching work has become more limited through the increase of the other work in the section. During the present year it was confined to general supervision of the practical classes.

CHEMISTRY.

Chemistry.

There were two classes only this year, the third year having completed their Chemistry course at the end of their second year. The year's work was handicapped by the six weeks' break caused by the outbreak of plague and closing of the Hostel. The second year on the whole worked satisfactorily and acquitted themselves creditably in the final on a fairly easy paper. The first year from a scientific point of view are rather a poor lot. A few at the top are fair, the rest medium or poor. This is possibly to some extent due to the above stoppage of work at a critical time, which would naturally tell more on men beginning a scientific subject. The teaching work has been almost entirely left to the Assistant Staff. The new Laboratories with their accommodation will permit of notes being written up on the spot and allow of a better idea of individual merit.

MINOR SUBJECTS SECTION.

Entomology.

This has been in charge of Mr. Khare. From Mr. Fletcher, Imperial Entomologist's remarks I am of the opinion that the type of teaching has improved. The work done was satisfactory. The expansion permitted by the removal of the Economic Botanist to the Research Laboratory will permit better conditions next year both for teaching and private work.

Veterinary.

This is taken by the 2nd and 3rd years. The second year course is Physiology and Anatomy and the third year course Veterinary Science. The second year are poor partly because they have treated this as a minor subject and partly because I do not think the lecturer has quite got the needed knack for elementary lecturing of this type. On the other hand Mr. Abdul Rahman has, I think, done excellently with the third year, who were considerably better in practical work than any I have seen hitherto.

Engineering Survey and Mathematics.

The first of these is taught to the third year only and consists of two courses– (*a*) Buildings (*b*) Machinery. The first being taught by a Public Works Department Overseer and the second by Mr. Cove, I think on the whole both were better, though the latter suffered by the reduction of time, by the result of plague. The third year also kept up their survey by field practice and received a theoretical course in Mechanics. The subject was a primary one in the final and the results showed a much higher standard than in the past.

Survey and Mensuration are the chief sections in the second year. The class are well above average in both, field work being quite good.

Mathematics.

This is chiefly taught in the first year. Experience has shown that students are often woefully weak. Increased time allotment has improved the standard.

Physics.

The class are fair only. There is a general lowness of scientific capacity in the first year both in this and in Chemistry, in both of which the loss of seven critical weeks told heavily and was certainly unlucky.

General.

This was the first year in which a third year class took the syllabus arranged in 1912. On the whole I am satisfied that the men who are turned out are better fitted to undertake field duties and practical farming. I realize, however, the fact that men of the Matriculation standard, specially if from the land, are heavily handicapped by the science in the early stages and that we thus lose men who might do useful wo rk

in the lower Subordinate cadre, while at the same time the course does not suit the man who only wants Agriculture for private ends, and if continued would have to be supplemented by a two years Farmers Son's course. As a result of further enquiries at Coimbatore and in view of the above the department has decided to adopt a $3\frac{1}{2}$ year course in two parts, the first being Agricultural and the second Scientific. This course will begin in 1915. Those in the College will continue on the 1912 course.

Conduct and Discipline. I have no remarks to make; both have been satisfactory.

Tours. The third year visited Raipur, Sindewahi, and Akola. The Northern tour was abandoned on account of plague.

College Buildings. There is little to report. The Research Laboratory opened at the end of the year. The only use made of the student Laboratories was for the Botany examination. The removal of the Economic Botanist and Agricultural Chemist from the College allows of the much needed expansion in lecture rooms and a College Hall. The latter will be created from the Chemical Laboratory in 1915-16. Fans and electric light in the College building have proved a considerable blessing.

The Economic Botanist has improved the appearance of the neighbourhood by the formation of an orange garden.

College Students. The entry this year has been heavier than in the two previous ones. The applicants admitted have for the most part been of direct Agricultural connection. I do not however think that the general standard of intelligence is high, though there are several promising men. Thirty students of those admitted joined the College after passing the physical tests. Six of these left during the year—two from sickness, three from disinclination for the course :—

		Beginning of year.	Appeared for examination.
First year	...	30	24
Second year	...	12	12
Third year	...	10	10
Total	...	52	46

The following is an analysis of the areas from whence drawn :—

	Central Provinces North.	Central Provinces South and East.	Nagpur.	Berar.	Central India.	Other places.	Total.
First year ...	14	5	4	...	4	3	30
Second year ...	4	2	...	2	2	2	12
Third yeas ..	2	3	...	1	1	3	10

This is the first year in which I have analysed the areas in the Central Provinces and Berar. Of those under Central Provinces South and East, four come from the Nagpur District, the rest of the old Southern Circle has produced very little during the past year. My thanks are due to Mr. Evans for his personal interest in recruitment and to the Head Master, Hoshangabad High School, through whom a number of applications come. Steps taken to spread information about the College throughout the Northern Central Provinces by means of pamphlets distributed by the Co-operative Credit Societies has no doubt assisted. I have pointed out to Mr. Ritchie the shortage from Berar and he has made Agricultural Education one of the points at district and taluq meetings, which has resulted in an increased number of applications from that side for next

year. Except in perhaps two or three districts I doubt if the rest of the Central Provinces give much scope for recruitment. I think it is important that the Principal should be known in the district by attendance at district meetings as men are more likely to send their sons to a distant place like Nagpur if they have some idea of the person under whom they will be. The altered course will be published as widely as possible during next year. The alteration has come into force too late to have much effect on the 1915 entrance.

EXAMINATIONS, 1915.

General Remarks.

The examinations were held between the 8th and 17th April or nearly a month later than usual. This was the result of the plague epidemic with an enforced absence from January 15th to March 8th, which formed a very serious handicap to the students, depriving them of a portion of the course set down and placing them in a bad position for working for their examination, there was thus a lowering in the general standard shown. There was difficulty in getting an external examiner in Agriculture. Mr. Ritchie however kindly undertook the work.

Examiners.

The examinations were carried through with the help of the following external examiners:—Mr. J. Ritchie (Central Provinces) in Agriculture, Mr. M'Crae (Madras) in Botany, Mr. Harrison (Madras) in Chemistry, Mr. Bainbrigge Fletcher (Pusa) in Entomology, Mr. Valladares (C. P. C. V. D.) in Veterinary, Mr. A. E. Joyce (P. W. D.) in Engineering.

RESULTS.

First year.

Total examined.	1st Class over 60 per cent.	2nd Class over 50 per cent.	3rd Class over 45 per cent.	Failures.
24	1	8	8	7

Three of the failures are men essentially suited to the new type of course. In two cases candidates failed in three of the four sections in which a pass is required. In the other cases failure in one subject was accompanied by distinct weakness in two others. There is only one first class man, he is in quite a class by himself, being some 12—13 per cent better than the next man on the list.

Agriculture on the whole fairly well done, several men were however poor in their field work. There was one first class and three failures.

Chemistry.—The paper set was not a difficult one, but taken as a whole the answers sent in were of a low standard. Most of the examinees showed considerable weakness in composition and although they had evidently absorbed a good deal of chemical fact their acquaintance had been too short to permit them getting a clear idea of the science as a whole. The first four men sent in better paper than the remainder who were uniformly medium. Compared with the others the first man is in class by himself.

Botany.—The break from studies lasting nearly two months has handicapped the junior students enormously and sufficiently accounts for their poor performance this year. Three men failed.

Minor Subjects.—Physics and Mathematics.—Geology was taken with Agriculture this year, my absence on leave prevented the course being a full one. On the whole the mathematics of the year is fairly satisfactory and above the standard shown in past years. Physics was fair.

Second year.

Total examined.	1st Class.	2nd Class.	3rd Class.	Failures.
12	2	5	2	3

One of the failures is so in all subjects, a surprising falling off in capacity as he was fifth last year. Minor subjects were as usual the section of greatest weakness, though the mathematical and survey standard was higher in a number of cases. Veterinary was distinctly badly done by all except two.

Agriculture.—The paper was not particularly well done. The practical was rather better except for one or two portions which evidently the students had not been properly taught on the farm. Two students failed and two were weak.

Chemistry.—With regard to answers given by the students these are on the whole an improvement on those of last year. This is particularly evident in the way students have kept closely to the questions. Questions relating to the dairy, the feeding and maintenance of cattle and the manurial aspects of soil chemistry were well answered. But weakness was indicated in soil physics and phosphatic manures. Five men were placed first class and one failed.

Botany.—Considering the disadvantages the students have suffered through breaks in their course of studies the results are fairly good. Three men are placed in the first division and one is a failure.

Third year.

Number examined.	1st Division.	2nd Division.	Failed.
10	1	7	2

The subjects were Agriculture, Engineering and Survey, Veterinary and Entomology.

	Examined.	1st Class.	2nd Division.		
			2nd Class.	3rd Class.	Failures.
Agriculture	10	1	6	2	1
Engineering and Farming	10	4	5	1	...
Veterinary	10	1	3	4	2
Minor subjects	10	1	3	4	2
Entomology	10	2	3	4	1

Agriculture.—The external examiner's paper was fairly well done as a whole and the general field work satisfactory: the examiners considered that the chief point of weakness lay in dairying. This is to be expected as the course is taught and practically done chiefly in January to March. Their absence at this time only allowed a rather crushed set of lectures and very little at the dairy except hurried demonstration. The second paper was fair but not brilliant. The marking standard was however not loose.

Engineering.—Generally the work in this was good. Mr. Joyce who examined in building construction stated that their knowledge was quite satisfactory.

Veterinary.—The practical knowledge shown was quite good, the examination was of a stiffer type than in past year.

Entomology.—As a whole the class did not appear to be of the same standing as last year. One man was a failure and two or three of the others weak. There were two men in the first division.

Prize Winners.

3rd year.

Director's prize for the best student	...	V. S. Gokhale.
Choudhari Agricultural Medal ...	...	D. S. Bengali.
Kedarnath Rai medal—Engineering	...	V. S. Gokhale.
Veterinary special ...	...	V. S. Gokhale.
Entomology special ..	...	Yar Mohamad.

2nd year.

Class prize	...	P. G. Deshpande.
The Smythie Chemical Medal ...	...	P. G. Deshpande.
Special prize Botany ...	...	P. G. Deshpande.
Special prize Agriculture (practical)	...	M. N. Golwalkar.
Special prize Minor subjects ...	...	K. P. Verma.

1st year.

Class prize	...	B. Subba Rao.
Chemistry and Botany special prize	...	B. Subba Rao.
Special prize Minor Subjects ...	...	B. Subba Rao.
Special prize Agriculture (practical)	...	Ramcharanlal Farsoyia.

The Hostel.

The Hostel continued under the charge of Mr. K. P. Shrivastav, who as usual fulfilled its duties in a thoroughly efficient manner.

Buildings.

The central block was converted into a sick room, recreation room and guest room, the old servants' quarters being used as godowns. The water-supply has been improved. Electric light has been supplied to the whole building.

Health.

Except for a few minor complaints this has been satisfactory. At the outbreak of plague in Nagpur all students were innoculated. As the epidemic continued and the nerves of the students appeared to be affected it was thought advisable to close. This was done about a fortnight after the educational colleges had done so.

The College Agricultural Association.

There were several meetings in which several quite fair papers were read by students on agricultural topics.

College games.

I cannot report a successful year. Our numbers are small, the larger majority of students of the type who join here have little or no past experience in games of any sort. The pick therefore in representative matches and inter-collegiate sports is very limited. The cricket eleven played some good matches and the Hockey eleven were more promising than in 1913-14. At the inter-collegiate sports we had to rest content with one first and two seconds. The old pavilion is in a state of final collapse and is being replaced by a new one. A grant of some Rs. 1,500 is necessary to get the ground into decent order for athletic purposes.

There was no College Day this year.

R. G. ALLAN,

Principal, Agricultural College, Nagpur.

RESULT OF THE EXAMINATION.

Third year.

No.	Name.	Total 710.	Class.	Remarks.
1	V. S. Gokhale ...	452	I ...	Awarded Director's prize, Special Veterinary and Kedarnath Rai Medal for Engineering.
2	D. S. Bengali ...	414	II ...	Awarded Choudhari Agricultural Medal.
3	T. B. Rairikar ...	404	II ...	
4	Yar Mohamad ...	402	II ...	Special in Entomology.
5	V. S. Pillay ...	388	II ...	
6	Abdul Aziz ...	381	II ...	
7	S. N. Choudhari ...	372	II ...	
8	R. S. Primpalkhare ...	359	II ...	
9	S. B. Deodar ...	299	Failed ...	Agriculture and Veterinary.
10	V. D. Kalvit ...	297	„ ...	Agriculture, Veterinary and Entomology.

Second year.

No.	Name.	Total 800.	Class.	Remarks.
1	P. G. Deshpande ...	531	I ...	Class Prize, Smythies Chemical Medal, Botany special.
2	K. P. Verma ...	482	I ...	Minor subjects special.
3	C. C. Sanyal ...	461	II ...	
4	J. K. Choudhari ...	429	II ...	
5	D. M. Bhave ...	429	II ...	
6	Anant Lal Shrivastav ...	426	II ...	
7	M. N. Golwalkar ...	424	II ...	Agriculture Practical special.
8	Y. V. Gowardhan ...	408	II ...	
9	G. Chalapati Row ...	397	II ...	
10	D. B. Patwardhan ...	379	Failed ...	Minor subjects.
11	J. Prasad Khare ...	372	„ ...	Agriculture.
12	S. A. Inamdar ...	319	„ ..	All Subjects.

NAGPUR:
The 14th May 1915.

R. G. ALLAN,
Principal, Agricultural College, Nagpur.

First year.

No.	Name.	Total 710.	Class.	Remarks.
1	B. Subba Rao ...	510	I ...	Class Prize, Chemistry and Botany special, Minor subjects special.
2	Ramprasad Ahir ...	412	II ...	
3	Ramcharanlal Farsoyia ...	406	II ..	Agricultural special prize.
4	A. S. Muley ...	388	II ...	
5	Lalsingh ...	380	II ...	
6	Moolchand Dubey ...	380	II ..	
7	K. P. Agre ...	378	II ..	
8	Sitaram Gour ...	371	II ...	
9	D. V. Takle ...	371	II ...	
10	Chunnilal Goil ...	351	II ...	
11	Jagdish Prasad ...	349	II ...	
12	Kungilal Rawat ...	348	II ...	
13	B. G. Nigudkar ...	344	II ...	
14	Ambika Prasad ...	343	II ...	
15	V. T. Dhavale ...	327	II ...	
16	Kundanlal Shrivastav ...	320	II ...	
17	Aziz Mohamadkhan ...	320	II ...	
18	K. K. Dey ...	315	Failed ...	Chemistry and Agriculture.
19	B. N. Joshi ...	314	„ ...	Botany and Agriculture.
20	K. R. Goverdhan ...	308	„ ...	Botany.
21	Ram Dayal Guru ...	308	„ ...	Agriculture and Minor subjects.
22	B. B. Barde ...	306	„ ...	
23	Liladhar ...	260	„ ...	Agriculture, Chemistry and Minor subjects.
24	Sardâr Singh, Rajput ...	243	„ ...	Chemistry, Botany and Minor subjects.

NAGPUR:
The 14th May 1915.

R. G. ALLAN,
Principal, Agricultural College, Nagpur.

STATEMENT H.—*Financial Statement of the Agricultural College, Nagpur, for the year* 1914-15.

	Heads of Expenditure.	Amount.			Remarks.
		Rs.	a.	p.	
1	Cost of College establishment	(*a*) 11,911	9	2	
2	Cost of Hostel Establishment and contingent charges	(*b*) 2,007	3	2	
3	Purchase of Furniture and apparatus	2,412	0	3	
4	Petty construction and repairs	(*c*) 1,105	11	1	
5	Games money	250	0	0	
6	Books for the Hostel Library	...	...	...	
7	Municipal taxes and fans and lights	568	2	0	
8	Expenses of students for visiting Farms	181	13	6	
9	Examination charges	683	0	0	
10	Scholarships	2,230	8	11	
11	Other charges	1,777	6	9	
	Total	23,527	6	10	

		Rs.	a.	p.	
(*a*)	(1) Pay of Principal, Agricultural College.	4,968	5	4	
	(2) His local allowance	1,200	0	0	
	(3) Pay of Masters	2,589	0	0	
	(4) Do. Clerks	1,028	11	4	
	(5) Do. Peons, &c.	350	0	0	
	(6) Travelling allowance of Principal, Agricultural College and his establishment.	1,775	8	6	(of which only a small portion is directly College.)
	Total	11,911	9	2	
(*b*)	(1) Allowance to Hostel Superintendent.	600	0	0	
	(2) Pay of Hostel Chaukidars, &c.	269	0	0	
	(3) Do. Cooks, &c.	734	12	9	
	(4) Contingent charges	403	6	5	
	Total	2,007	3	2	

	Rs.	a.	p.	
(*c*) Excluding	2,365	13	6	for Veterinary Assistants' quarters.
	800	0	0	for cost of iron shed for partial farm use.
Total	3,165	13	6	

R. G. ALLAN,
Principal,
Agricultural College, Nagpur.

Statement showing the particulars of English classes for the year 1914-15.

Classes.	Number on the roll.	Average daily attendance.	Average on the roll.	Classification according to creed and race.						Classification according to caste.			Districts from which recruited.						Age of pupils.			Parents' occupation.						
				Musalmans.	Hindus.			Others.	Total.	Brahmins.	Others.	Total.	Bengal and United Provinces.	Berar.	Central Provinces.	Native States.	Rest of India.	Total.	Maximum.	Minimum.	Average.	Government Service.	Private Service.	Profession.	Trade.	Agriculture.	Miscellaneous.	Total.
					Bengali.	Maratha.	Northern Hindus.																					
3rd year.	10	9·5	10	2	1	6	...	1	10	7	3	10	...	1	4	1	4	10	25	21	23	4	...	1	...	4	1	10
2nd year.	12	10·8	12	...	2	6	...	4	12	6	6	12	...	1	9	...	2	12	23	19	21	3	1	...	...	5	3	12
1st year.	24	22·2	25·5	1	...	12	...	11	24	9	15	24	...	...	20	2	2	24	23	18	205	7	2	1	...	12	2	24

R. G. ALLAN,
Principal, Agricultural College,
Nagpur.

Report of the Economic Botanist, Central Provinces, for 1914-15.

The year 1914-15 will stand out as the beginning of a new era in the botanical work in these Provinces. In March 1915, as the new Agricultural Research Institute was nearing completion, permiss on to occupy the North wing was granted, this being the portion of the building which has been designed for the work of the Botanical Staff. In place of the two rooms in the Victoria Technical Institute the section is now accommodated in nine rooms in the Agricultural Research Institute. These rooms have been fitted up for research work. In addition to this a fruit experimental garden has been started, and sanction has been received for an experimental market garden to be run, on co-operative lines with the vegetable growers, at Chhindwara :—

Agricultural Research Institute:—The Agricultural Research Institute contains the Laboratories and offices of the Agricultural Chemist and the Economic Botanist. The Laboratories of the Civil Veterinary Department are also situated in it, while room has been found for the office of the Principal of the Agricultural College. The Institute is specially constructed with regard to research work, and the Laboratories form a compact centre for investigation. The building is situated close to the Victoria Technical Institute and is of a U-shape consisting of a central block facing Victoria Road and two wings running back to the west at right angles to the road. The South wing containing 12 rooms is occupied by the Agricultural Chemist and his Staff. The Economic Botanist and his Staff occupy 9 rooms in the North wing where the northern exposure gives the best light for microscopical work. The Research Staff of the Civil Veterinary Department have two rooms in the North wing and the right half of the Central block. The office of the Principal of the Agricultural College is in the left half of the Central block. The large entrance hall is situated in the Central block, and one of the adjoining small rooms is fitted up as a dark room for photographic purposes. Outside the building and close to the Civil Veterinary Department Section a serum pit for the storage of serums has been constructed.

The Agricultural Research Institute is distinct from and independent of the Agricultural College. As before mentioned the Institute is built for research work. There are, however, two class rooms in which Chemistry and Botany are taught by the Assistants in those subjects. The control of the internal economics of the building has been placed in charge of the Agricultural Chemist, the external economics being under the control of the Economic Botanist. During the absence on leave of the former the whole control of the economics of the building has been placed in charge of the Economic Botanist. This has necessarily involved a considerable amount of time and thought, but there is intense satisfaction in planning out the minor details for an Institution which will mean so much for the development of Agricultural and Veterinary Science in these Provinces.

Rice.—Testing of selected lines of rice has made slow progress. At Nagpur the pure line cultures were maintained, while 30 early rices were tested at Adhartal. From the Experiment Station Report, the following figures are available with regard to rices tested at the Adhartal Farm:—

No. of Rice.	Produce per acre, 1912-13.	Produce per acre, 1913-14.	Price per Khandi valued in Nagpur.
	Lbs.	Lbs.	Rs. a. p.
8	1,406	2,200	19 0 0
9	1,650	707	...
11	1,812	1,219	22 8 0
12	1,507	1,257	23 0 0 new. 25 0 0 old.
13	2,375	1,030	24 0 0
14	...	724	23 0 0
16	...	803	23 0 0
17	...	1,079	24 0 0

No. of Rice.	Produce per acre, 1912-13.	Produce per acre, 1913-14.	Price per Khandi valued in Nagpur.
	Lbs.	Lbs.	Rs. a. p.
24	...	1,600	24 0 0
33	853	1,042	23 0 0
42	...	476	26 0 0
43	...	1,422	...
56	...	1,277	24 0 0
71	1,133	600	20 0 0
72	1,190	708	22 0 0
73	466	657	32 0 0
74	773	408	30 0 0
77	1,117	1,026	26 0 0
83	...	611	22 0 0
85	...	1,044	24 8 0
86	...	1,176	22 0 0
88	...	1,964	22 0 0
91	...	1,755	24 0 0

Of these Nos. 8, 11, 12, 13, 24, 77, 88 and 91 are very promising varieties as regards yield. Nos. 12 and 77 combine a high yield with a good quality of grain. Two distinct problems are involved in improving rice. For the ordinary cultivator, yield is the important thing, but for more advanced cultivators and those who have facilities for irrigation quality may make up for what is lost in yield in the better rices. The ideal aimed at is one rice which combines the two characters, and No. 12 approaches this qualification. The testing at Adhartal has been limited owing to the fact that only early or early medium rices can be tested there, and the low outturn of some of the lines is due to this fact.

The systematic study of the wild rices of the Central Provinces has proved a formidable task, as over 100 different specimens have been collected. These are all being grown under observation at head-quarters.

Juar.—The study of the problem of natural crossing in this crop has been continued with regard to certain characters of the grain and glumes. It has been possible, after overcoming a certain number of technical difficulties, to reproduce a number of the crosses artificially. The frequency of natural crossing in the crop in the Central Provinces accounts for the multiplicity of forms found in cultivation under various vernacular names. It is hoped that a study of the unit characters in crosses will enable progress to be made with the classification of a crop which, up to the present, has withstood all attempts at arrangement in any scientific scheme of classification.

Wheat.—The work on wheat has been continued on the same lines as last year. The selections from the New South Wales crosses were grown in pure cultures. A certain amount of cross-breeding has been done with a view to producing a rust resistant variety for the Provinces.

Capsicums.—The demand for the selected seed continues to grow, and in the present year was so great that many orders had to be refused after the stock of seed was sold out. A certain misunderstanding seems to have arisen in regard to the early round chilli. This variety is particularly suited for land which is not commanded by irrigation as it ripens on the rainfall received during the monsoon and hence requires no irrigation. Where facilities for irrigation exist it is more profitable to grow one of the later varieties. The early round chilli has, however, brought the possibility of chilli cultivation within the means of any cultivator. The classification of the varieties grown in the Central Provinces has been completed by Mr. K. P. Shrivastava, Assistant Economic Botanist, and will appear as a Departmental Bulletin.

Sunn Hemp.—Further progress has been made with the study of the seed characters of this crop. The practice of early sowing with irrigation during the hot weather in garden land has been continued with success.

Cucurbitas.—The most serious obstacle in the extension of the cultivation of the selected varieties of water-melons in these Provinces is the flooding which occurs in the months of February and March. Another obstacle in the way of progress is the reluctance of the cultivators who grow selected seed to part with it. Further study of the varieties of *Cucumis sativus* and *Citrullus vulgaris* has revealed no better variety of the former than the Jalgaon melon and the Tapti Valley variety of the second. An extremely palatable variety of the usually insipid Kadu (*Cucurbita sp.*) has been grown in the Botanical Garden.

Cotton.—For the higher portions of the Plateau Division where frost prevents the growing of ordinary varieties, an attempt has been made to isolate an early cotton. From the selected lines 13 were considered suitable for the area in question and have been sent to the Deputy Director of Agriculture, Northern Circle, Central Provinces, for testing.

Herbarium.—The collections have been re-arranged in the spacious room provided as a Herbarium in the Agricultural Research Institute. No large collections were added during the year but regular collecting has been continued.

Botanical Garden.—The area around the Agricultural Research Institute has been handed over to this section. The front portion will be maintained as an ornamental garden, while the portion behind the building extending to 3 acres, is being utilised for a collection of plants arranged in natural orders. The work of transferring the plants from the old Botanical Garden behind the Victoria Technical Institute can only be started in the rains. Two new plant houses have been added in the Agricultural Research Institute compound, one to contain the collection of local ferns and orchids, and the other for the reference collection of foliage plants. A small propagating house with a glass roof has been erected as an experiment in order, if possible, to save the more delicate pot plants during the dryness of the hot weather. The first effort in the new botanical garden was to grass down a mound of earth, 20 feet high with a slope of 1 in 2, erected by the Public Works Department to keep the serum pit belonging to the Veterinary Section cool. The grass *Cynodon dactylon* was planted by "leaping" in May. For the first week the newly planted grass was shaded. The growth of grass was entirely satisfactory, but the desired advantage of grassing down the loose earth before the monsoon was largely lost owing to the fact that the irrigation water made its way through the roof of the serum pit.

Fruit Experimental Garden.—The waste land lying to the south-west of the Victoria Technical Institute has been cleared, levelled and laid out as a small experimental fruit garden. Attention will mainly be given to oranges. Experiments dealing with manures, the influence of stocks, optimum quantity of water, &c., will be laid down. The chief practical interest in these experiments lies in the large area of land available for citrus cultivation under Ramtek tank. The experiments will all be of practical value. In the manurial series attention will be concentrated mainly on locally available manures. Stocks will be tested and the best stock for each class of soil will be discovered. Introduction of other kinds of citrus fruits will be carried out as the Nagpur orange is at best a fancy orange unsuited for experiment.

Manurial Series.—The series of experiments dealing with manures has been established. The details of the manures were worked out in consultation with the Agricultural Chemist. Trees were arranged in rows. In each row there were twelve trees, and in all sixteen rows. The rows were manured with nitrogenous manures, while the lines were cross-dressed with non-nitrogenous manures. The basis of the experiment was to find out the best combination of manure at a given cost. This was taken at 2 annas per tree in the first year, rising by two annas annually to 10 annas in the fifth year when the trees should be in bearing. The following nitrogenous manures are being experimented with :— Cattle-dung, green manure, castor cake, mahwa refuse, Calcium nitrate; the

cross dressings are of superphosphate, potash and superphosphate combined with potash. The weight of manure given to each tree varies with the kind of manure and the combination used, but in every case the cost is limited to the fixed money value.

Stock Experimental Series.—In stock experiments it is essential to have buds taken from one scion in order to see the effect of the stock. The following stocks have been raised and are being budded from one orange tree, the quality of whose fruit is known :—

Jambari.	Pumelo.
Kagzi.	Wild lime.
Malung.	Mozambique.
Orange.	Sweet lime.

Varieties.—The following varieties have been introduced and are growing well :—

Washington Navel ...	Imported from California by A. E. Lowrie, Esquire, Chhindwara.
Eureka Lemon ...	
Thompson's Improved Navel ...	
Royal George Navel ...	Bangalore.
Gujaranwala ...	Economic Botanist, Punjab.
Sylhet lime ...	Director of Agriculture, Assam.
Sylhet orange ...	
Seedless lime ...	M. R. Murray, Esquire, Harda.

With regard to orange growing one fact stands out clearly. The local practice of irrigation is expensive, wasteful and not beneficial to the tree. From monsoon to monsoon only four irrigations were given to the young plants in the manurial series. The water was given by rings, and as soon as it had soaked into the ground the irrigation ring was filled in with earth. The amount of water given per tree averaged 30 gallons. This figure corresponds with the amount of water given in the Margarita Garden, Chhindwara, but on the lighter soil there nine irrigations were required. The amount of water required for an acre of young orange trees works out therefore at 30,000 to 40,000 gallons a year.

Other Fruit Trees.—Varieties of mangoes, peaches, sapotas, guavas and figs have been planted in the ground available after laying out the orange experiments. The varieties of mangoes were received from the Empress Garden, Poona, and Lal Bagh Garden, Bangalore. To the Superintendents of these Gardens, to the Director of Agriculture, Assam, Mr. A. E. Lowrie, Mr. M. R. Murray and the Economic Botanist, Punjab, I wish to offer my thanks for the plants received.

Co-operative Market Garden at Chhindwara.—A scheme for providing Nagpur with a supply of fresh vegetables throughout the year has been drawn out in consultation with Mr. A. E. Lowrie. The scheme resolved itself into a co-operative market garden, composed of local vegetable growers centred round a small experimental market garden to be run by the Department. The local vegetable growers showed a remarkable keenness on the project, and when the garden is started, Nagpur, even in the hot weather, will have a plentiful supply of English vegetables. Sanction to start the work was obtained with the proviso that nothing should be done till Mr. A. E. Lowrie has been relieved from his military duties in connection with the war. All that has been done is to acquire the land for the experimental garden.

Guayule, Parthemium Argenteum.—The plants again flowered during the rains but the seed was infertile. In America propagation is carried out mainly by root suckers. So far none have appeared on the introduced plants. The plants are thoroughly established and the crop has not been irrigated.

Other work.—During the year seeds and plants were sent to various private individuals and public institutions. Of the seeds distributed the majority were selected rices, capsicum and varieties of cucurbitas.

In co-operation with the Economic Botanist to the Botanical Survey of India, the collection of edible tubers and edible fungi was continued by the kind assistance of the Forest Department.

The vernancular names of the fungi used as food, together with their scientific names, is of interest. The identification of the specimens was carried out by the Economic Botanist, Botanical Survey, to whom I am indebted.

Scientific Name.	Vernacular Name.	Forest Division in which vernacular name is used.
1	2	3
Armillaria eurhiza	Ashadi Bhamori	Nagpur-Wardha.
	Jewti Bhamori	
	Dasar Bhamori	
	Dumar pihiri	Balaghat.
	Bhonda pihiri	
	Tekora	Chanda.
	Banro perhi or Perhi ...	Bilaspur.
	Kukur muta	Jubbulpore.
Pleurotus fimbriatus ...	Bans pihiri	Seoni.
	Bhamodi	Balaghat.
	Bans pihiri	Bilaspur.
Pleurotus cretaceus	Bans pihiri	Hoshangabad.
Pleurotus sapindus	Do.	
Pleurotus sp.	Bhadur Bhamori	Nagpur-Wardha.
Omphalia hydrogramminae ...	...	Balaghat.

The subjoined list compiled from information supplied by the Economic Botanist to the Botanical Survey gives the scientific name, vernacular name and district in which the vernacular name is used of the majority of the edible tubers sent in from the districts of the Central Provinces and Berar.

I wish here to express my thanks to the officers who by sending in tubers have helped to make such a full list and to the Economic Botanist, Botanical Survey, for identifying the specimens.

Scientific Name.	Vernacular Name.	District in which name is used.
Hibiscus sp. ...	Bhursa Kanda ...	Drug.
	Kapis Kand ...	Seoni.
	Kapas Kand ...	Narsinghpur, Seoni.
	Bun bhendi or Kapsa Kanda ...	Balaghat.
	Kapusi Kand, Semar Kand or Rai-jal ...	Mandla.
Bombax malabaricum ...	Semar Kand ...	Narsinghpur, Drug.
	Musar Kanda ...	Balaghat.
	Bagai Kand ...	Narsinghpur.
Leea sp. ...	Hanthi Kand ...	Raipur.
	Bijnori Kand ...	Balaghat.
Uraria picta ...	Bagai Kand ...	Narsinghpur.
Pueraria tuberosa ...	Bharda ...	Hoshangabad.
	Sanwal Bhang ...	Raipur.
	Kakora ...	Mandla.
Phaseolus adenanthus ...	Sarawan ...	Melghat.
	Sirua Kand ...	Mandla.
Zehneria umbellata ...	Kundru Kanda ...	Drug, Balaghat, Raipur, and Jubbulpore.
	Gulakhri ...	Saugor.
	Gulaphre ...	Narsinghpur.
Pycnocycla glaucum ...	Thej raj ...	Balaghat.

Scientific Name.	Vernacular Name.	District in which name is used.
Peucedanum Dhana	Kam raj	Balaghat, Raipur.
	Bal raj and Kam raj	Mandla.
Peucedanum Nagpurensis	Bhoj raj	Balaghat.
Hemidesmus indicus	Dudhia Kand	Balaghat.
Ceropegia bulbosa	Oudhia Kand	Buldana.
	Bawasia	Narsinghpur.
	Bachul Kand	Chanda.
Ceropegia hirsuta	Bhajia Kand	Seoni.
	Supari Kand	Chanda.
Ceropegia sp.	Khapri Kand	Betul.
	Kelarua or Kelaloo	Narsinghpur.
	Dudhmalida	Amraoti.
	Patrangi	Mandla.
Habenaria platyphylla	Chilam chattu	Balaghat.
Eulophia sp.	Kukari mundi	Raipur.
Curcuma longa	...	Drug.
Curcuma spp.	Thenkhoor	Balaghat.
	Tikhur or Teokhar	Jubbulpore.
	Tikhur	Raipur, Mandla.
	Burga (Boda)	Raipur.
	Genji Kanda	
	Taj raj, Bhoj raj	
Costus speciosus	Keo Kand	Balaghat, Drug, Seoni.
	Kev Kand	Balaghat.
	Kilaloo	
	Mard-raj-jal	Mandla.
	Keo Kand or Marda Kanda	Raipur.
Curculigo orchioides	Musor Kand	Balaghat.
	Kali Musri	Betul.
	Koa Kand	Drug.
	Kari Musri	Hoshangabad.
	Kali Moosli	Mandla.
	Musar Kand	Raipur.
	Dudhmongra	
Dioscorea daemona	Baichandi Kand	Balaghat.
	Khapri Kand	
	Patrangi Kand	
	Bijnori Kand	
	Baichandi Kand	Betul, Seoni, Drug, Nagpur, Hoshanagabad, Raipur Mandla, Narsinghpur.
	Sura Kand	Drug.
	Daichandi	
	Pahari Agitha	Mandla
Dioscorea pentaphylla	Subaria	Saugor.
	Chunchuni Kand	Balaghat.
	Baichandi	Mandla.
	Lourangi	
Dioscorea oppositifolia	Mohri	Saugor.
	Kiras Kand	Seoni.
	Kirasmati Kand	Nagpur
	Girchi Kand	Balaghat, Mandla.
Dioscorea glabra	Nand mati	Seoni.
	Bittay Kand	Jubbulpore.
Dioscorea belophylla	Nand Kand	Seoni.
	Dondchi Kand	Mandla.
	Bada Kand	Jubbulpore.
	Kania Kand	
	Girchi Kand	
	Peet Kand	Raipur.

Sceintific Name.	Vernacular Name.	District in which name in used.
Dioscorea bulbifera ...	Aghita ...	Saugor, Mandla, Raipur.
	Jangli gathaloo ...	Betul.
	Karua Kand ...	Drug.
	Noska ...	Seoni.
	Jangli Gathora ...	Hoshangabad.
	Mataver Kand ..	Balaghat.
	Ban aghita ...	Jubbulpore.
	Karua Kand ...	
	Karoo Kanda ...	Raipur.
Dioscorea alata ...	Goradi ...	Nimar.
Dioscorea spp. ...	Nag Kand ...	Betul.
	Bampidee Kand ...	Drug.
	Kiras Kand ...	Seoni.
	Girchi Kand ...	Mandla.
	Kanhiya Kand ...	
	Seeka Kanda ...	Raipur.
Asparagus racemosus ...	Jogi-Latti ...	Mandla.
Chlorophytum sp. ...	Sukh Semaiyan or ...	Narsinghpur.
	Ban Semaiyan ...	
	Safed Moosli ...	Mandla.
	Safed Musri ...	Betul.

(1) *Mycology.*—The most important work is the breeding of rust resistant wheats. This work is carried out in co-operation with the Deputy Director of Agriculture, Northern Circle, Central Provinces.

(2) *Publication.*—The only article which was completed for publication within the year was "A Note on the Ferns of Pachmarhi" published by the Bombay Natural History Society.

(3) *Tours.*—During the year 129 days were spent on tour. All the Experimental Farms were visited and visits were paid to Lyallpur, Cawnpore, Poona, Coimbatore and Sabour. A short collecting trip was made to Chikalda in July.

(4) *Staff.*—Mr. J. Fernandez joined this section as second Fieldman in January 1915. Mr. Gregory was again granted an extension of service and continues to renew his youth. His knowledge of local gardening is invaluable. Mr. S. C. Roy received a well merited increase in pay. Mr. Kalka Prasad entered the Provincial Service in April 1915, but still remains attached to the section. He is the first member of the Research staff to be promoted to the Provincial Service and has gained the distinction by conscientious hard work and thorough reliability. Mr. V. N. Ranganath Rao, L. Ag., a former student of the Nagpur Agricultural College, joined the section in July 1913 as a second Assistant. The course of this Assistant in his student days was full of promise and the report from the Mysore Department of Agriculture in which he served prior to returning to his *alma mater* was eminently satisfactory.

R. J. DOUGLAS GRAHAM,

Economic Botanist, Central Provinces.

Report of the Agricultural Chemist, Central Provinces and Berar, for the year ending 30th June 1915.

This year marks a new epoch in the history of the Agricultural Chemist's Section, in that we got into the long-wished-for new Laboratory building about the middle of April 1915. During the last 2 months of the year we were engaged practically in the arranging and fitting up of apparatus in the new building.

Mr. Plymen having gone on leave, I was put in charge of the current duties of the Agricultural Chemist, Central Provinces, in addition to my own work, from 17th April 1915. The staff remains, as in previous years, of the same strength, *viz.*, two in number.

The Agricultural Chemist went on tour to all the farms and took samples of special soils from Umrer side. Besides, he was invited to conduct examinations in Chemistry at the Agricultural Colleges, Sabour and Coimbatore.

Report on the instructional work carried on in connection with the Agricultural College has been forwarded to the Principal. As science was to be taught and finished in 2 years, more time had to be devoted to lectures and practical work, and this kept one assistant fully engaged. That the instruction was sound and grasped by the students is evident from the report of the Examiner, and credit is due to Mr. Ram Narayan, who was solely responsible for the teaching.

Routine analytical work carried on for the Department and outside public continues to increase in quantity ; the following samples were received :—

Water	2
Manure	51
Feeding stuff	13
Soils	2
Limestones	2
Oilseeds and Miscellaneous	5
	75

Of the 75, 30 samples of varied character were analysed for the cultivators, and it is pleasing to note the increased interest the public are evincing.

Investigation.—A long series of determinations have been carried on regarding the chemical and physical characteristics of the fact of buffalo milk produced by changes in season and feeding. All data on the fat of buffalo milk, including the analyses of the various feeding stuffs used during the entire lactation period of the animal, are ready, and the investigation was continued on the milk and butter fat of a cow. But the cow having dried up prematurely owing to untimely death of its calf, this work could not be completed, and it will be taken up as soon as a cow can be had. The work will be extended to the milk from herds of buffaloes and cows.

The second main line of investigation in progress during the year was the determination of the nitrogen-distribution in some of the best known local coarse and fine varieties of paddy. For this purpose three chief kinds of early, medium and late ripening varieties of fine and coarse paddy samples were taken. Total Kjeldahl nitrogen and soluble nitrogen were determined in the husks, grains and polishings of all varieties, but for want of space in the old Laboratory further delicate work, as, for example, determination of amino groups, etc., could not be done, but will be continued in the new building.

Sugar-cane received considerable att ention, and a series of analyses were done at the Government Farms, Telinkheri, Tharsa and Adhartal.

At Adhartal all the thin and thick varieties were analysed at the end of 12—13 months of growth, and as a result some of them have been rejected and others kept for further trials. Series of determinations were done with a view to find out to what manure the local thin varieties—Barahi and Khari—respond. The results and analytical figures will be found in the farm report.

At Telinkheri and Tharsa many of the varieties were analysed just one year after they had been planted. In addition, a series of analyses was carried out at Tharsa aiming at determining the time of planting and cutting of Sunnabile canes. Our last year's observations were proved to be true, *viz.*, (1) Ashy Mauritius was the best cane in point of yield of *goor* per acre, purity of juice and the least susceptibility to disease. (2) The juice from Sunnabile canes planted in October and November yielded the greatest quantity of *goor* and contained the highest sucrose percentage when cut in the middle of February.

Other analyses dealt with the results of using heavy and light setts and topshoots and whole canes for planting. Here again our last year's observations were confirmed :—

(1) Juice from Sunnabile canes planted with top-shoots contained higher percentage of sucrose than that of the canes planted from whole ; whereas reverse was the case in Ashy Mauritius variety.

(2) There was not much difference in the juices of Sunnabile canes planted with heavy and light setts. Juice from heavy setts contained a little higher sucrose percentage than that of the canes from light setts.

A method for analysing magasse samples for their moisture, fibre and sucrose contents was successfully worked out. This work was taken up mainly to determine the fluctuations, if any, in the fibre contents of canes as cane ripens. A good deal of difficulty was experienced in obtaining uniform samples of magasse, and the work could not be completed for want of a cane reducer.

A. R. PADMANABHA IYAR,
Agricultural Chemist (in charge),
Central Provinces.

Annual Report of the Central Museum, Nagpur, for the year 1914-15.

I.—Finance.

The opening balance to the credit of the Museum on 1st April 1914 was Rs. 2,739-8-4. The donation made by the Government for the year under report was Rs. 4,722.

The amount credited into the Treasury during the year ending 31st March 1915 came to Rs. 365-14-0, making the total receipts under all heads Rs. 7,827-6-4.

The expenditure incurred during the year under contingencies amounted to Rs. 6,882-5-9, and the year closed with a balance of Rs. 945-0-7—*vide* Appendix A.

The actual expenditure incurred on account of salaries and travelling allowances (including servants paid from contingencies) amounted to Rs. 3,867-1-0 and Rs. 365-9-3, respectively, against Rs. 3,716-6-5 and Rs. 306 of last year.

II.—Public Rooms.

The Rooms were let 13 times during the course of the year for theatrical and other purposes, as compared with 35 times during the previons year. The amount thus realized was Rs. 104-0-6. The Rooms were required twice and sometimes three times a month for meetings of the War Relief Fund, District Council and Civil Station Sub-Committee. The Chairman of the Board of Examiners under the Central Provinces Boiler Act was granted the hall free of charge for three days for the Boiler Act Examination.

The decrease in the receipts from the Public Rooms is due to the fact that the Rooms are not regularly engaged for theatrical performances, the superstructure of the stage being no longer fit for erection.

III.—Industrial Section.

The replacement of the Industrial Section by an Ethnological collection and the systematic arrangement of the Ethnological exhibits can only be carried out when the Museum extensions are completed. The primary incentive for making a collection of Ethnological exhibits was a request from the British Museum that typical exhibits from the various tribes, races and castes in the Central Provinces should be kept for reference in London. Sir John Miller, who suggested the idea to the British Museum, and through whom we entered into communication with the British Museum Authorities, writes: "You might possibly care to get into communication with the Museum people on a subject which the Central Provinces can illustrate better than any other part of India. The Ethnological collection there is full of Polynesian and Malayan exhibits, many of them no better than we can produce, but India proper is very poorly represented. Your Native States, especially Bastar, would probably yield material that would be highly valued." A beginning was made in February 1913, when Rai Bahadur Hiralal, Extra-Assistant Commissioner, Chhindwara, was appointed collector in addition to his other duties. Attention was confined to the Gonds in that district. By November 1914 a remarkably fine and representative collection had been made. As far as possible the collection was in duplicate, one exhibit being kept for the Central Museum, the other being sent to London. The exhibits for the British Museum together with a descriptive catalogue prepared with great care and completeness, were despatched to London in December 1914. Sir C. H. Reid, in acknowledging receipt, remarks: "I hope to write you more at length in connection with the specimens and the very valuable monograph that accompanied them."

IV.—Archæological Section.

"The Historical Sketch of the Central Provinces and Berar from the Earliest Times," "The Descriptive List of Exhibits in the Archæological Section of the Central Museum," and "The Introduction to the Descriptive

List of Exhibits," prepared by Pandit V. Natesa Aiyer when working as an Archæological Assistant in the Museum, were sent to the *Pioneer* Press, Allahabad, by the Superintendent, Government Printing, Central Provinces, owing to the difficulty found in obtaining the special type required locally. These publications were received during the year from Allahabad. In the year no additions were made to this Section.

Numismatics.—The Catalogue of the Muhammadan Coins has been undertaken by Mr. M. A. Suboor, who has nearly finished the Catalogue of the Moghal Coins.

During the year collection for the Coin Cabinet of the Museum was increased by 384 coins, which were received from various sources as detailed in Appendix B.

Besides the coins for the Cabinet, 11 coins (2 gold and 9 silver) were received for sale. From the list of coins offered for sale, 37 were sold, realizing Rs. 38-13-0.

V.—Natural History Section.

Birds and Mammals.—During the year 72 birds and 14 mammals were collected, chiefly from Nagpur, Bilaspur, Pachmarhi and Hoshangabad. Among some of the more conspicuous birds mounted for the show cases are an Osprey, a Malabar Pied Hornbill, a large Cormorant, a Demoiselle Crane and groups of Pochards and Cormorants in their natural surroundings.

Among others, the egg of the Hawk-Cuckoo (*Hieroeoccyx varins*) has been added to the egg collection. The mammals mounted for exhibition include a wolf, caracal, tiger and pangolin.

Reptiles.—The collection of local snakes was removed from the bird-room on account of want of space and was not displayed to the public. The aquatic chelonia of Bilaspur and Nagpur was collected to some extent, and the following species identified:—

Kachuga tectum intermedia (Blanford).
Emyda granosa intermedia (Annandale),
Trionyx gangeticus mahanadnicus (Annandale).

A lizard (*Ophiops jerdonii*) was collected at Pachmarhi, and a large 'mugger' (*Crocodilus palustris*) from Bilaspur.

Vivaria.—The following snakes were added to the Vivaria:—

Rat Snake or Dhaman (*Zamenis mucosus*),
Brown Tree-Snake (*Dipsadomorphus trigonatus*).
Russell's Viper (*Vipera russellii*).
Green Keelback (*Macropisthodon plumbicola*).
Ladder Back (*Simotes arnensis*).

The Dhaman laid 16 eggs on the 4th June, the Brown Tree-Snake 5 eggs on 12th September, and the Green Keelback deposited 6 eggs on the 18th March and a seventh on the 1st April.

Insects.—Local species of the orders Neuroptera, Coleoptera and Rhynchota were arranged for exhibition in index form.

Educational.—The breast bone of a peafowl was suitably mounted to show the principal features of a *Gallinaceous sternum.*

A dissection of the head of a Cobra was mounted showing the fang, poison gland and duct leading to the fang.

Two Hemiptera have been mounted in the Insect Cabinet to display the terminology used in describing the external anatomy in this order.

Specimens of insects from the Museum were lent for a lecture on Darwinism, and photographs of the birds beneficial to agriculture were sent to the Pusa authorities for the purpose of producing plates.

It is proposed to bring out from time to time a series of papers dealing with the fauna of the Provinces. The first of these dealing with the snakes of Nagpur is in preparation.

Tours.—A prospecting tour was made by the Assistant Curator to Khandwa and Hoshangabad in August, and he collected in Bilaspur during the months of December and January. In March Pachmarhi and Hoshangabad were visited.

Visitors.—The total number of male and female visitors for the year was 73,964 and 27,063 respectively, making a total of 101,027. The average number per day was 277. The decrease in the number of visitors is mainly due to the outbreak of plague in the year under report.

VI.—ESTABLISHMENT.

There was no change in the establishment during the year.

The Museum is open to all daily from 7 a.m. to 6 p.m., except from midday on Wednesdays, when it is reserved for female visitors and *pardanashin* ladies.

The average number of visitors who availed themselves of this privilege shows an increase from that of last year.

Most of the bell-metal articles kept in the Museum were sold, showing that articles of this type find a ready market in Nagpur.

Museum Extensions.—The following note by Mr. C. E. Low, C.I.E., I.C.S., late Director of Agriculture and Industries, Central Provinces, gives the proposed lines for extension of the Museum :—

"There are two sets of proposals regarding the future extension of the Nagpur Museum. One has reference to the immediate requirements of the Museum which I will call Scheme A, and the other refers to certain additions to the Museum which are necessary to enable it to take its part in the teaching of the proposed Central Ptovinces University (Scheme B).

2. Scheme A contemplates the following additions :—

(1) Room for mammals.
(2) Office room.
(3) Extension of the Archæological Section.

(1) Has been for years recognised as an obvious necessity if we are to aim at a representative collection of the most interesting feature of the Province from a Museum point of view, *viz.*, its fauna. It will add enormously to the attractiveness of the Museum in the eyes of the public, and we are now in a position to say that it will not take us long to fill it with a decently mounted and thoroughly interesting collection.

(2) Both office and technical work are at present carried on under the greatest possible difficulties, and it is necessary to arrange at once for separate accommodation, especially if we are to attempt to set up any of the larger mammals. A separate small office room will also greatly economise much-needed space for exhibits.

(3) The enlargement of the Archæological Section will enable us to place in this Section all the exhibits of historic interest, such as coins, armour, &c., as well as the statuary and inscriptions that we have at present. This is absolutely necessary from the point of view of the proposed scheme for connecting the teaching of the University with the Museum, and it is no less necessary if we are to carry out the immediate proposal of turning the Miscellaneous Section into an Ethnological Section. As I have stated in the Annual Report and elsewhere, the present Miscellaneous Section is in a perfectly hopeless state of mixture. It contains a large number of articles which may be classed as Ethnological either from a scientific or from a popular point of view, and, as well, a number of exhibits of artistic or industrial interest and of a historical nature. In addition to these, there is a perfect mass of absolutely useless things such as a model of the Nagpur Church, various specimens of inlaid marble of the most debased description such as are sold to tourists on every railway platform, and a farrago of other things which have only one common characteristic, namely, their utter

unsuitability for a Provincial Museum. It will be a great step in advance if we can devote this room to the subject which, next to the fauna of the Province, is our most striking local feature, *viz.*, our forest tribes. Some arrangement will have to be made for the display of artistic exhibits, but these are neither numerous nor important, and it should not be difficult to arrange a small room or a gallery in the existing room for their accommodation.

3. When discussing the extensions required by the Museum, the Chief Commissioner contemplated the provision of accommodation sufficient for the above proposals, and Mr. R. J. D. Graham, Honorary Curator, has undertaken to work out the necessary plans in consultation with the Executive Engineer.

4. Scheme B relates to the proposal to render the Museum a useful adjunct to the teaching of the proposed University. It is an essential feature of the University Committee's scheme to base its teaching, where possible, on acual local conditions, whether historic, economic, or scientific. It would add very greatly to the expense of the University to attempt a collection of exhibits on a sufficiently large scale independently of the existing Museum. If Scheme A is worked out, Scheme B can be put through without very considerable increase to the recurring expenditure, and probably only an equal amount of further initial expenditure to that which will be involved in the Scheme A, and should put the Museum in a position to fulfil the demands of the University for the above purpose. This scheme involves the following additions :—

(1) The removal of the economic exhibits from the Victoria Technical Institute to the Museum, where they will be reclassified and very greatly added to, in such a way as to make them thoroughly representative of the various industries concerned. This is the most important feature of the scheme.

(2) The addition of a Botanical and Geological Section.

(3) The placing of each of the different Sections of the Museum under the immediate charge of an honorary head, who would ordinarily be the senior Professor of the subject to which the Section relates. It is a matter of some doubt how the general work of the Museum would be co-ordinated. On the whole I should feel inclined to allow it to remain as at present under the Director of Agriculture, who would be responsible for the general control, for the co-ordination of the Sections and for the finance.

5. The details of this scheme are being worked out by Mr. Graham on behalf of the University Committee. There is no question of its being taken up for some years to come, and in any case there is no immediate hurry. One advantage in the considerable increase which it would entail in the size of the Museum would be that the Public Rooms, if still retained as a part of the Museum buildings, would occupy a much less conspicuous position in them than is the case at present.

6. The Local Administration will, I understand, provide funds as soon as possible for the inception of Scheme A. I should like to take this opportunity of placing it on record that the Museum has, in my opinion, a very valuable asset in Mr. D' Abreu, and I think there can be no possible objection to admitting him to greater responsibilities than at present he fulfils. I should be sorry to see Mr. Graham's connection with the Museum, which has had such important results in the raising of its general standard during the last few years, entirely severed, and I should like him to remain as Honorary Curator, visitor, advisor, or in some similar capacity ; but, owing to the more active policy being at present pursued in regard to Mr. Graham's Section of the Agricultural Department, more and more claims are being made on his time, and his absences from Nagpur tend to grow much more frequent. For these reasons I should like to see Mr. D'Abreu appointed Curator as soon as the Local Administration will agree to this step and his maximum salary substantially increased. It is at present only Rs. 200, and he is not far from reaching it. He is a keen lover of Science, a good practical taxidermist and a steady and reliable worker. I do not see why the maximum pay of his appointment should be less than Rs. 400.

The plans and estimates proposed in paragraph 3 above have been worked out in consultation with Mr. J. Desmond, Executive Engineer, Public Works Department. They are as follows :—

Extensions of the Central Museum.

These proposed extensions cover the necessary accommodation for the expansion under Scheme A.

Scheme A.—According to the present scheme the Central Museum, when re-arranged, will contain the following sections :—

(1) Natural History.
(2) Ethnology.
(3) Archæology.

The Natural History Section has been arranged mainly from an educational standpoint. At present birds are well represented by mounted specimens in large show-cases. There are also drawers containing skins for the purpose of more particular study of any of the species. Each case contains printed labels stating the main features of the sub-order and general in the case, important points being illustrated by diagrams and dissections. In addition, there are dissections and diagrams representing the most important features of the bird family. The Museum possesses a unique collection of the eggs of local birds, and an attempt has been made to set up the nests of the commoner local birds in natural surroundings.

A case showing birds beneficial and injurious to agriculture, with their different foods, has recently been added.

The reptiles have been similarly treated and the collections of these two families are fairly representative of the local fauna.

There is a good index collection of insects and a fair collection of local fish.

The collection for the Ethnological Section is at present proceeding but has not been arranged so far.

The Archæological Section contains sculptures, monuments, inscriptions and coins. The sculptures and monuments have been described in detail, and a catalogue, containing also an introduction to the archæology of the Province, has been published. The inscriptions have all been published, and a classified list of the inscriptions in the Provinces is in the Press. Numismatics are well represented in the Museum, as Nagpur stands high on the distribution list. A catalogue of the Moghal coins is in preparation.

Zoology.—Accommodation in the present Museum will be sufficient when a new room 60′ × 30′ has been added. The section will then consist of three rooms, *viz.*—

(1) Bird Room 50′×23′
(2) General Room 64′×25′
(3) Mammal Room 60′×30′

Of these (1) is already arranged, (2) is the present office and side-room of the public room and (3) is a new addition.

Ethnology.—In the Central Museum it is proposed to accommodate the Ethnological Collection in two rooms.—

(1) 84′×25′
(2) 22′×50′

Room (2) is at present used for Archæological Exhibits. The space is considerable, but allowance must be made for full display of exhibits.

Archæology.—The present room is 22′ × 50′ and is overcrowded. Practically double the present wall space or its equivalent is required. The three sections—Sculptures, Inscriptions and Coins—can be accommodated in two rooms. The first containing Sculptures and Monuments, the second Inscriptions and Coins. The second should have barred windows and expanding iron doors.—

(1) Sculptures 60′ × 30′
(2) Inscriptions 30′ × 30′.

Office and Work-rooms.—A new Museum Office 15′ × 15′ will have to be built to replace the present office which is accommodated in part of the room which will form one of the Zoological rooms. Store rooms are also necessary for this section: one for storing surplus specimens, and another for storing material. Neither of these rooms should be less than 14-9″ × 14-9″. The present work-room is an enclosed portion of the verandah 20′ × 10′. It is too small, and the new work-room should be at least 20′ × 20′. In addition to this, a well ventilated drying room is an absolute necessity before the mammal collection can be worked up.

The size of this should be the same as the work-room, *viz.*, 20 × 20′. A separate office for the Assistant Curator is also necessary, say 22′ × 14′.

These office and work-rooms are for the Zoological Section alone.

Nagpur is, however, worthy of a better museum than that sketched in the proposals under Scheme A, and one way in which this can be accomplished is by securing a larger number of persons to take an interest in, and be responsible for the collections in the Museum. The further additions and extensions necessitated by the proposals under paragraph 5 are detailed below:—

Scheme B.—Without much difficulty a really good museum containing the following sections could be secured:—

1. *Natural History*—
   - (*a*) Zoology.
   - (*b*) Botany.
   - (*c*) Geology.
2. *Economic Products*—
   - (*a*) Agriculture.
   - (*b*) Forestry.
3. *Ethnology.*
4. *Archæology*—
   - (*a*) Sculptures.
   - (*b*) Inscriptions.
   - (*c*) Numismatics.

To make these sections successful a Superintendent of each section is wanted who should be a man interested in the work of the section. The actual amount of time demanded from each Superintendent would not be excessive once the section was arranged. There would have to be a Museum Office run either by one of the Superintendents or by a separate Curator. The bulk of the heavy work would fall on him. His position with regard to the Superintendents would have to be defined.

Each section in the Central Museum would be an extension of the teaching collections in the various sections of the Colleges in Nagpur, but containing rarer and more expensive specimens than each College individually could afford to purchase for itself.

Taking for granted that funds are provided by the Local Administration for the extension of the Museum, as at present proposed, the following sections will be represented in the institution in the immediate future:—

1. *Natural History*—
   - (*a*) Zoology.

2. *Ethnology.*

3. *Archæology—*

(*a*) Sculptures.

(*b*) Inscriptions.

(*c*) Coins.

The additional sections proposed in order to make the Museum a useful adjunct to the University are—

1. *Natural History—*

(*b*) Botany.

(*c*) Geology.

2. *Economic Products—*

(*a*) Agriculture.

(*b*) Forestry.

Botany.—A room 30′ × 40′ will be sufficient to hold the collections as the majority of the economic plants will be in the Economic Section. Sixteen cases on the wall and six sloping cases with upright sections may be roughly estimated as sufficient to contain the collections to start with. The cost of the wall-case is Rs. 120; for the sloping case with upright Rs. 60. The cost would therefore be—

	Rs.
16 cases at Rs. 120	1,920
6 cases at Rs. 60	360
Total ...	2,280

Geology.—A room 30′ × 40′ ought to be sufficiently large. Extra wall space is required to display geological maps and sections. Allowing 16 wall-cases with sloping fronts and upright cases behind at Rs. 60 each, and six central sloping cases at Rs. 35, the cost is—

	Rs.
16 cases at Rs. 60	960
6 cases at Rs. 35	210
Total ...	1,170

Economic Products—Agriculture.—The present room in the Victoria Technical Institute is 70′ × 36′ and is occupied with agricultural and forest products, textile and geological specimens. Allowing 30′ × 40′ for agricultural products and textiles, with 16 cases at Rs. 120 *plus* 24 Kew type herbarium cases at Rs. 18, the cost is—

	Rs.
16 cases at Rs. 120	1,920
24 cases at Rs. 18	432
Total ...	2,352

Forests.—A room 30′ × 30′ should be sufficient to contain 12 cases at Rs. 120, 12 herbarium cases at Rs. 18 and six sloping cases—

	Rs.
12 cases at Rs. 120	1,440
12 cases at Rs. 18	216
6 cases at Rs. 35	210
Total ...	1,866

If the proposal of sectional Superintendent is introduced, Botany will require two rooms, an office 14′-9″ × 14′-9″ and a combined store and work-room of the same size. Geology, Agriculture and Forests would require the same. These additions will, as far as one can see, make the Museum an institution in which

the natural resources of the Provinces can be fully displayed, the necessary material for teaching natural science, history and economics being furnished by the actual local examples.

At present there are in the Victoria Technical Institute valuable collections which would form the basis of the sections referred to above. Offers of local material for the Geological Section have been frequently made by the Survey. The sole reason why these have not been accepted is lack of accommodation in the present building. The Central Provinces and Berar Exhibition of 1908 furnished a good collection of the economic products of these Provinces. The disadvantage of having collections in separate buildings is manifest, and to remedy this it is proposed to unite the collections in one institution, placing each section under the expert care of an honorary Superintendent, who will be, in the majority of cases, a professor in the University. The cost of bringing these collections into the Museum is small. Buildings form the heaviest item and amount to Rs. 11,000. Fittings for the four sections run to Rs. 8,000. The recurring expenditure on staff and contingencies is less than Rs. 6,000.

The details are—

Staff—

		Rs.
8 Peons @ Rs. 8	...	768
2 Clerks @ Rs. 40	...	960
1 Custodian @ Rs. 18	...	216
1 Fieldman @ Rs. 25	...	300
Total	...	2,244

Contingencies—

Natural History, Botany and Geology, Furniture	...	500
Miscellaneous	...	500
Total	...	1,000

Economic Section—

Furniture	...	1,000
Miscellaneous	...	1,000
Total	...	2,000
Total additional cost	...	5,244

As Curator of the Museum my idea is to have an institution in Nagpur worthy of the Central Provinces and Berar. The Museum will be unique in that collections will be local, and hence there will be no competition with all Indian institutions, such as the Indian Museum. The value of having local material for teaching purposes cannot be overestimated. Not only will it stimulate interest in the natural features which surround the student's path on every side, but material for investigation will always be available to those who wish to pursue their studies further.

R. J. DOUGLAS GRAHAM,

Curator,

Central Museum, Nagpur.

APPENDIX A.

Receipts and Charges under Contingencies, including Servants paid from Contingencies, Travelling Allowances under the same head during the year ending 31st March 1915.

Details.	Actuals.	Total.	Remarks.
Receipts.			
Opening balance on 1st April 1914	2,739 8 4	0 0 0	
Allotment for 1914-15	7,417 0 0	0 0 0	
	10,156 8 4	0 0 0	
Transfers under orders of Director of Agriculture and Industries, Central Provinces.	2,695 0 0	0 0 0	
	7,461 8 4	0 0 0	
Amount credited into the Treasury	3,651 4 0	7,827 6 4	
Expenditure.			
Miscellaneous and other contingent expenditure, including salaries and travelling allowance of servants paid from contingencies, &c.	6,882 5 9	6,882 5 9	
Closing blance on 31st March 1915	0 0 0	945 0 7	

APPENDIX B.

Statement showing the number of Coins received in the Central Museum, Nagpur, during the year ending 31st March 1915.

Donor's name.	Gold.	Silver.	Copper.	Billon.	Lead.	Total.
Under Secretary to Government, United Provinces	...	17	16	14	...	47
Superintendent, Government Museum, Madras ...	3	4	...	...	4	11
Director of Agriculture and Industries, Central Provinces.	...	254	...	65	...	319
Bombay Branch, Royal Asiatic Society, Bombay ...	1	4	...	...	...	5
Diwan, Nagod State, Central India ...	...	2	...	...	...	2
Total ...	4	281	16	79	4	384

R. J. DOUGLAS GRAHAM,

Curator, Central Museum.

The Maharaj Bagh Menagerie.

Buildings.

There has been considerable discussion with regard to buildings, and plans for the same, for the animals housed in the Gardens.

The chief requirements before any further extension of animals can be made are—

(*a*) A monkey house.

(*b*) A house for small Carnivora.

The former will be, it is hoped, undertaken in 1915-16. The latter will be arrived at by a reconstruction of the present monkey house for this purpose.

Since the last report—

(1) the tiger house has had two outside cage extensions completed, thus making four large cages and four dens. The centre has also been reconstructed, making an inner den, while arrangements are under consideration for laying on water and providing baths in the larger cages;

(2) the bear pit has been caged in above;

(3) the small dear paddocks are in process of being refenced and provided with covered sheds;

(4) the main water gate on the large paddock has been reconstructed and rendered efficient;

(5) additional shade has been provided in the Aviary;

(6) a store godown has been completed;

(7) quarters for the Veterinary Assistant in charge have been constructed on the farm.

Health.

During the year under report there was an outbreak of Rinderpest among the deer. The case was detected at an early stage and prompt inoculation prevented any further extension.

The general health of the stock has been good. We have had a few losses among deer due to physical injury and accidents in the paddock. One tiger and one panther after long life in captivity died of old age.

New Animals.

The following were presented *to the Zoo*:—

1 Barking deer, H. C. Greenfield, Esq.

1 Sambar, Raja Sahib, Kawardha State.

1 Four-horned deer, Raja Sahib, Udaipur State.

8 Peacocks
11 Parrots
3 Mainas
1 Civet-cat
1 Tiger
} The Diwan, Bastar State.

1 Panther, Raja Bahadur, Raghoji Rao.

The Sambar, Spotted Deer, Indian Gazelle and Indian Antelope are breeding freely.

The presentation of the tiger above was a most welcome addition to the Carnivora Section. Another tiger has been promised by the Raj-Nandgaon State.

The varieties of animals and birds in the Zoo require extension. A number of letters have been issued asking for help, but with the above exception they have had very little result. Considering the expenditure done and contemplated on buildings, the expenditure of two or three thousand rupees in addition on animals and birds is, I think, desirable. Correspondence is at present in hand with the Calcutta Zoo and one or two private owners, and it is hoped that next report will see a considerable improvement in the variety.

In dealing with new animals it is only right to note the generous action of the Bengal-Nagpur Railway Authorities in permitting free transport of animals over their system.

Control.

The Menagerie has been under the direct charge of Mr. Shukla, Veterinary Assistant, who has shown a very creditable keenness in the impovement of the animal conditions and care of the stock in health and disease. Mr. Shukla's other duties include the Veterinary care of the College Farm Dairy and work stock, those of Telinkheri and those of Tharsa. Telinkheri has provided him with a lot of work during the past year. During the year he inoculated 233 animals against Rinderpest and 285 animals against Hæmorrhagic Septicemia.

R. G. ALLAN,

Principal,

Agricultural College, Nagpur.

Department of Agriculture, Central Provinces and Berar.

REPORT

ON THE

1. AGRICULTURAL COLLEGE, NAGPUR,
2. BOTANICAL AND CHEMICAL RESEACH,
3. ENTOMOLOGICAL WORK,
4. CENTRAL MUSEUM, NAGPUR,
5. MAHARAJ BAGH MENAGERIE,

FOR THE

Year ending the 30th June 1916

1914 15

Nagpur

PRINTED AT THE GOVERNMENT PRESS.

1917

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FOR

THE YEAR 1915-16.

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College Report, 1915-16.

Work during the Year.

As a result of a decision arrived at in April 1915, the College course underwent a further change during the year under report. The second and third-year students continued under the old curriculum, in which science is dealt with in the first two years and applied subjects, principally agriculture, are taken in the third year. The first year of 1916 opened under the new form of curriculum. The new course is divided into two parts. The first two years are devoted to agriculture, with attention to farm engineering and elementary Survey and Veterinary. This forms the teaching work for a two-year Diploma course in agriculture and the first part of the Degree course. Both the Diploma and the Degree students get the same treatment—a practical education in applied agriculture and allied subjects. As far as the Degree course is concerned, to all practical purposes only men of Matriculation or education standard above this are eligible. Only those, however, who pass in the first Division of the first two years will be permitted to proceed to the second part or more scientific study of the subject. The Principal, however, possesses the option of allowing a man whose preliminary education is below that of a passed Matriculate to proceed to the higher course in the event of his having shown special capacities in his first two years. The two-year or Diploma course (the first part of the Degree course) is also open to sons of genuine agriculturists of a standard just below Matriculation, but who show sufficient knowledge of English and elementry Mathematics to pass the College entrance examination.

Agriculture.

As a result of this change of course there has been a very considerable addition to the teaching and demonstration work of the agricultural section as both the 3rd and 1st years were principally engaged in farm work. The maximum of strain on the agricultural teaching staff and on the resources of the farm will be reached in 1916-17, when there will be no relief afforded by Chemistry and Botany and all three years will be engaged in agriculture. It is as yet early to forecast as to what effect will be produced by this change of course on the type of student turned out from the College. As far as Agriculture is concerned, the steady almost daily practical work has certainly given the students of the first year a better knowledge and greater practical ability than students of the old course even at the end of their second year. A number showed themselves both capable and good workers. The third year continued along the same lines as last year and showed themselves on the whole up to the average standard. The agricultural work of the second year with one or two exceptions, at any rate from the practical aspect, was above the standard of past year. The Principal and Mr. Phatak dealt with the lecture work of the different years. The field classes due to the necessity of duplication in the first and second years and the continued pressure of the former made considerable calls on the time of the farm staff. The Superintendent of the farm controlled the field work of the third year. Mr. Sule, Farm Overseer, and Mr. Phatak that of the second year, while Mr. Phatak, Mr. Ghate (probationary College Assistant) and Mr. Pendse (Farm Assistant) shared the agricultural field classes of the first year.

The first-year course from a lecture standpoint is divided into two sections—the first contains a little "popular" science and is principally agricultural in aspect, the second is devoted to Mathematics, Mensuration, Chain Survey and Elementry Building.

The Agricultural Staff received assistance in dealing with lectures of a Chemical and Botanical character from the staffs of the Agricultural Chemist and Botanist.

A certain number of the daily practical periods were devoted to the practical work associated with Survey and Building.

CHEMISTRY.

This subject was only taken by one year—the second year on the lines of the old course. Mr. Ram Narayan, Assistant Chemist, was in charge of the year's lectures and work. The Laboratory work was conducted under much improved conditions. In spite of this, the standard shown was below that of past years. The year was not a good one from a scientific standpoint; their general level of preliminary education is below that of previous years and indeed that of the majority of the first year. The general low standard shown in examination cannot be credited to imperfect instruction.

BOTANY.

This has been taught to the second year only. The work during the year appears to have been steady, but there appears to have been a tendency on the part of the students to accept statements without fully understanding them and to draw things in practical work without fully realizing what they saw. Generally speaking, the class is of a standard of preliminary education below the normal. In the past years this type of course which increased the time given to Botany and Chemistry teaching in the first two years had proved more satisfactory than that in which it was spread over three years. This year, probably due to a lower type of intelligence, it appears to have failed.

The new courses to which we are now committed places this Chemistry and Botany teaching in the second part of the course and restricts it to those who are passed in the first division. The longer period of preliminary education and the elimination of the less bright intelligence will give both sciences a better chance and lead to greater assimilation of the scientific method which is really of more value than scientific fact.

MINOR SUBJECTS.

Entomology.

This was taught to third year and a short preliminary course given to second year. The removal of the Botanical Section to the new Laboratories and the extension thus possible has led to better teaching conditions. In this subject, however, as taught for agricultural students' requirements, field work is of more value. The teaching and work has been satisfactory and of the same standard as in past years, though the Examiner indicates that the importance of the practical rather than the theoretical side.

Veterinary.

This was taken by the second and third years. The veterinary lectures were given by Mr. Ayer, Veterinary Assistant at the Hospital, who also gives a short course in Section I of the first-year course. The practical of the third year was controlled by Mr. Shukla, College Veterinary Assistant. The third year were, on the whole, satisfactory and the second year, though not perhaps what they should be, largely on account of other calls on their time, were better than usual.

Engineering Survey.

Two courses in Building construction were given—one to the third year of weekly character by Mr. Cuerden of the Engineering School, the other of continuous type to first year by Mr. Bansidhar, Public Works Overseer. In the latter course, as alternative halves of the year were engaged in practical Engineering, it was possible to undertake a definite practical work. The year constructed an effective brick culvert on the farm. This course was of rather an experimental character. The experience of the year has, however, permitted a better judgment of what can or cannot be done in the time at disposal. The usual course in machinery was given to the third year by Mr. Cove. In the coming year, arrangements will have to be made for a similar course for the second year and also one in elementry carpentry.

Mr. Khare again took charge of the Survey work of the second year and gave a short course in Chain Survey to the first year. In both cases the knowledge shown by students was very fair.

Mathematics and Mensuration.

These were taken by Messrs. Phatak and Ghate—the first dealt with the second and third year and the latter with this subject in Section II of the first year. The general standard and knowledge of students shows an improvement on what it was in the earlier years of the College.

General.

The third year were on the whole perhaps below the standard of past third years, though their work was generally satisfactory. The second year contain a number of students who are fairly efficient agriculturists, and the agricultural field work of the year is certainly better than that of the second year in 1914-15. Except for one student, who is considerably above the average, the rank and file are not possessed of marked intelligence, a fact reflected in the more scientific sides of the subject. The first year contains several men of good ability, and I think on the whole, perhaps with three or four exceptions, their style and standard of field work is well above the average The new course is open to two drawbacks. These do not lie in the type of curriculum or its utility, but in misconceptions. The first is the tendency to recommend or consider men for the two-year course only and neglect the all-important fact that generally this class of man is of lower intellectual type and is never likely to be of value in the higher posts of the Department, though he may be useful in the lower grades. Effort should be directed by those who are interested in getting men for the Agricultural service towards encouraging men of a better type of brains as well as those whose chief and often only recommendation is that they are from the land. The College is willing to receive men for the two-year course, particularly sons of the bigger landowners and patels, who will eventually apply their training on their own property, but there is a limit to the number of men of this pure agricultural type. Men recommended or advised to apply for admission to this two-year course must be agriculturists, and though a certain proportion can be poorer men recommended as likely to be useful in service later, the effort of officers and Assistants in the Province should be directed towards inducing the better classes with agricultural interests to send their sons. Any undue increase of the proportion of this type tends to increase the second misapprehension among the public, which arises out of the combined character of the Degree and Diploma courses in their first two years. It is a little difficult for a student of the better type of intellect to realize when he first joins that there are two courses running in one. He, after having passed well in the Matriculation, finds himself on joining at the same work and apparently in an equal position with some one over whom he knows he is superior. Other things being equal, he will undoubtedly go ahead of the other students and, later, perceives the difference, when he qualifies to pass to the second part of the course; but in the first critical weeks he is apt to feel that he has lost ground by joining this College, and hence at times leaves, when, if he had stayed, he would have proved a desirable student. I intend to make this, however, clearer in the next prospectus.

I would draw attention to the scheme of scholarships at schools for giving really bright boys a chance of sufficient elementary education to allow of their taking the full College course and would press that every effort be made to select and fill up these scholarships annually. I am of the opinion that a list of these scholarship-holders should be sent to me regularly. Up to date I have not seen any of them at the College.

Conduct and Discipline.

I have no remarks to make; both have been on the whole satisfactory. One student was dismissed because of his lack of discipline. There were a few petty thefts, but though enquiry was made the culprit was not discovered. Generally field work and class attendence has been good and cases of malingering few.

Tours.

The third year visited Raipur, Akola, Sindewahi and Hoshangabad. In the coming year both the second and third years will be taken on tour, probably at different times.

College Buildings.

There is little to report. The opening of the Research Laboratory has permitted generous accommodation for Chemistry and Botany in that block and permitted the very necessary expansion required in the College proper. The old Chemical Laboratory has been fitted with platform and is now the College Hall It still, however, requires furnishing. The Entomological section has expanded into the room at one time used by the Botanist.

College Studiees.

The entry this year partly on account of the double character of the new course was much heavier than in the past. Taken all over the type of student joining was good, and the class contains several promising men.

Forty-one students were finally admitted. Several of these, however, left early in the year, leaving 37 on the College books in this year at *Divali*. Partly on account of inadaptability, lack of health and failure to give satisfaction this number was then reduced to 31—

	Beginning of year.	Appeared for examination.
1st year	41	31
2nd year	18	18
3rd year	12	11

The following gives an analysis of the areas from which students attending the College are derived:—

—	Central Provinces, North.	Central Provinces, South and East.	Nagpur.	Berar.	Central India.	Other places.	Total.
1	2	3	4	5	6	7	8
1st year ...	13	4	4	3	5	2	31
2nd year ...	11	1	2	...	2	2	18
3rd year ...	4	...	1	2	...	3	10

The Annual Examinations, 1916.

The examinations were held between the 16th and 26th of March in order to suit examiners.

The examinations were carried through with the help of the following external examiners—

Mr. R. C. Wood (Coimbatore), Mr. Clouston (Central Provinces) and Mr. Ritchie (Central Provinces) in Agriculture; Mr. Annett (Bengal) in Chemistry; Mr. Milne (Punjab) in Botany; Mr. Bainbrigge Fletcher (Pusa) in Entomology; Mr. Valladares (Central Provinces Civil Veterinary Department) in Veterinary; Mr. Joyce (Public Works Department); Mr. Cuerden (Engineering School) and Mr. Cove (School of Handicrafts) in Building and Machines.

Results.

First year.

Total examined.	First Class, 65 per cent.	2nd Class, 50—65 per cent.	3rd Class, 40—50 per cent.	Failures.
31	2	20	3	6

The class were examined on the two sections in which the teaching, as explained, is divided. Three papers and four practicals were given in Section I, *i. e.*, Agriculture, and two papers and one practical in Section II. The examination was conducted in Agriculture by Messrs. Clouston, Ritchie and Phatak and myself and in the second section by Messrs. Cuerden, Phatak and myself. Full consideration was given to a man's work during the year. Questions relating to Chemistry and Botany were set by Messrs. Plymen and Graham in the first section papers. As is natural in a mixed group of two educational standards, there is considerable difference between the top and bottom men. Some of the most serious breakdowns occurred in Section II where Mathematics and Survey were the chief stumbling blocks. Of the six students who failed, two were Matriculates and in for the College or Degree course, and four were non-matriculates in for the two-year course. Generally the standard attained by the class was good, and a very big percentage separates the lowest pass student from the highest failed one. Two students were classed as first division on the old standard and several only failed to do so by a few marks. About 12 or so appear to be likely to get a first division standard in the second year. The student who stood second in Agriculture and sixth on the total mark was a non-matriculate—

Second year.

Total examined.	1st division, pass.	2nd division.	3rd division.	Failure.
18	1	4	7	6

The year is a poor one, especially in the more scientific subjects; the general low standard is shown by the preponderence of third class passes and failures. All those who failed did so in at least two subjects and one man failed in all. The student in the first division is a long way in advance of any of the others and owes his position partly to a better brain and partly to a better general education before joining.

Agriculture.—The paper was very fairly done. Only one student was bad and two weak. The practical on the whole was good and better than in past years.

Botany.—The external Examiner classed four students as fair and failed four " The drawings made by the students in their practical class books shown to me were most excellent, but the results got from all phases of the examination were very far below what one would have expected from an examination of their books. In the answers to questions put to them the majority of the students mixed up what had been taught them in a most extraordinary fashion. Two points seem to me to be obvious—

(1) that the elementary education of many of the students appears deficient;

(2) that the subject-matter of the course is more than they could properly assimilate in the time at their disposal."

Chemistry.—Three students failed. With the exception of the first three, the general standard is low. The Examiner was again of the opinion that the standard of preliminary education was too low to allow of proper assimilation of the subject.

In reference to these two unfavourable reports I may note that they are the first of their kind which these two subjects have received at the hands of outside Examiners. There is no avoiding the fact that the recruitment of 1914 was distinctly below any of previous years, and though the great majority are nominally Matriculates they are of a poor type intellectually, and represent a group who would have been the better of the winnowing process of the new course before launching into science.

Minor Subjects.—These embrace Mensuration and Survey, Elementary Anatomy and Physiology and Entomology. Taken all over, this section of the examination was done better than in other years. It is quite possible that some of the inferior results shown in the last two subjects has arisen from rather greater attention to these minor subjects, which are considered together in aggregate and have in the past frequently been the chief source of failure. With the exception of three—four students, Survey and Mensuration was quite respectably done, and the knowledge of field work shown was satisfactory. Four students were considered below the mark in Anatomy and Physiology, but on the whole the year appeared to know more than the one preceding them—

Third year.

Number examined.	1st division, over 65 per cent.	2nd division, over 45 per cent.	Failed.
10	...	9	1

Agriculture.—The examination was conducted by Mr. Wood, of Coimbatore, and myself. Mr. Wood, however, dealt with the practical examination himself. He gave them a full practical and oral. He considered the results thoroughly satisfactory and the answers to the written paper as good. One student was below standard. Two others were weak and the rest he considered good.

Engineering.—Generally the subject was very fairly well done. Mr. Joyce, who examined in Building Construction, stated that the knowledge shown was satisfactory. One student was in the first division.

Veterinary.—Some six students did satisfactorily, while three were weak and one failed. On the whole, the subject was better done than in 1915.

Entomology.—The Examiner, Mr. Bainbrigge Fletcher, expressed himself as fairly well satisfied. He indicated that the tendency of training seemed to err in not being sufficiently directed to the probable requirements of agriculturists rather than entomologists. Four students did well, while one was a failure and another nearer border line than he should have been.

Prize Winners.

Third year.

Director's Prize for the best student	...	P. G. Deshpande.
Choudhari Agricultural Medal	...	C. C. Sanyal.
Veterinary, Special	...	P. G. Deshpande.
Entomology, Special	...	M. N. Golwalkar.
Kedarnath Rai Medal, Engineering	...	K. P. Varma.

Second year.

Class Prize ...	...	B. Subba Rao.
The Smythies Chemical Medal	...	
Special Prize, Botany	...	A. S. Muley.
Special Prize, minor subjects	...	B. Subba Rao.
Special Prize, Agriculture (Practical)	...	Ramcharanlal Farsoyia.

First year.

Class Prize	...	R. G. Chaurey.
Section I Prize	...	B. S. Katey.
Section II Prize	...	Shiv Narayan Derashri.
Prize, Practical Agriculture	...	Manoolal Goil.

THE HOSTEL.

Mr. K. P. Shrivastav continued to act as Superintendent in a thoroughly efficient manner.

Buildings. No alterations are to be reported. Arrangements and plans have been made for an extension of the Hostel by one quadrangle. In the year passed the accommodation available in the Hostel was in full use. The Hostel at present accommodates 68—70 students. In the coming year the number estimated will probably be about 85. These can only be fitted in by giving up the sick-room, store-room, guest-room and recreation room and increasing the number in the bigger dormitories. The extension on the point of being taken up will permit of an increase of accommodation up to 36.

Health. There was a certain amount of malarial fever among students. Otherwise, the health of the College was satisfactory.

The College Agricultural Association. There were several meetings in which interesting papers were read.

College games and social life. On the whole, College games were in a more satisfactory state during the past year. The cricket eleven did fairly well and the hockey eleven did better in tournament games. In the Inter-Collegiate Sports the exceptional excellence of two students of the Hislop College robbed the games of any real competitive interest. The students of the second and first year did most of the work. The third year have never since the year they joined been of any value to the College in this respect. In fact, they have proved poorer as leaders of College life than any of the senior years before them. A medal for general interest in College athletic life and athletic, capacity was generously presented by Mr. Kartar Singh, an old student of the College. This was awarded to Aziz Mohammad Khan, a student of the second year, who worked hard in keeping the College hockey practices going and was the only student to earn points in the Inter-Collegiate Sports.

A new pavilion was erected during the year and steps initiated towards improving the black cotton soil of the field as a playing area. This will have to be continued for several years before any real and lasting improvement is possible.

The College day was celebrated on 20th and 21st December 1915. A dramatic performance, sports and prize-giving marked the event. Mr. Sly, Commissioner of Nagpur, kindly presented the prizes.

R. G. ALLAN,

Principal,

Agricultural College, Nagpur.

Result of the Examination.

No.	Name.	Total 3rd year. 500.	Class.	Remarks.
1	2	3	4	5
1	P. G. Deshpande ...	547	II	Director's Prize, Special Veterinary.
2	K. P. Varma ...	541	II	Kedarnath Rai Medal for Engineering.
3	C. C. Sanyal ...	508	II	The Choudhari Medal for Agriculture.
4	V. D. Kalvit ...	490	II	
5	M. N. Golwalkar ...	486	II	Special for Entomology.
6	D. M. Bhave ...	444	II	
7	G. Chalpati Raw ...	434	II	
8	S. B. Deodhar ...	421	II	
9	Anantlal Shrivastav ...	400	II	
10	J. K. Choudhari ...	363	Failed.	
		2nd year 900		
1	B. Subba Rao ...	640	I	Class Prize. The Smythies Chemical Medal. Special for minor subjects.
2	A. S. Muley ...	493	II	Special for Botany.
3	S. A. Inamdar ...	475	II	
4	S G. Nigudkar ...	464	II	
5	Ram Prasad Ahir ...	458	II	
6	Lal Singh ...	455	II	
7	Sitaram Gour ...	436	II	
8	Kunjilal Rawat ...	426	II	
9	K. P. Agre ...	416	II	
10	Moolchand Dubey ...	412	II	
11	V. T. Dhavale ...	412	II	
12	Ramcharanlal Farsoyia ...	407	II	Special for Agriculture.
13	Kundanlal Shrivastav ...	383	Failed.	
14	Chunnilal Goil ...	373	,,	
15	D. V. Takle ...	371	,,	
16	Ambika Prasad ...	370	,,	
17	Aziz Muhammad Khan ...	350	,,	
18	Jagdish Prasad ...	337	,,	
		1st year 680		
1	Radha Krishna G. Chaurey ...	460	I	Class Prize.
2	Shiv Narayan Derashri ...	457	I	Section II prize.
3	Baba Saloba Katey ...	434	I	Section I prize.
4	Nathulal Puranchandra Varma ...	419	I	
5	Ram Sanehi ...	418	I	
6	Manoolal Goil ...	416	I	Practical Agriculture Special.
7	Badri Narayan Ioshi ...	399	II	
8	Ravi Shankar Shrivastav ...	399	II	
9	Kirpal Singh ...	394	II	
10	N. Ramloo Ramayah ...	389	II	
11	Anand Dhar ...	383	II	
12	P. C. Parihar ...	380	II	
13	D. N. Andharey ...	380	II	
14	T. A. Bhoge ...	378	II	
15	K. K. Pillay ...	377	II	
16	Vishwanath Trivedi ...	375	II	
17	K. S. Bhide ...	371	II	
18	V. G. Hardikar ...	360	II	
19	B. D. Patil ...	358	II	
20	Raj Bahadur Varma ...	358	II	
21	Narayan Prasad Shrivastav ...	351	II	
22	Jugal Kishore Sharma ...	347	II	
23	Sirdar Singh ...	339	II	
24	Damroolal Goil ...	334	II	
25	Majeed-ul-Haq ...	326	II	
26	Gajanan Shukul ...	275	Failed.	
27	M. K. Narayan Pillay ...	265	,,	
28	K. S. Joshi ...	250	,,	
29	Gulal Rao Zapuji Patil ...	245	,,	
30	M. R. Khirwadkar ...	220	,,	
31	G. K. Salpekar ...	158	,,	

R. G. ALLAN,

Principal,

Agricultural College, Nagpur.

STATEMENT H.—Financial Statement of the Agricultural College, Nagpur, for the year 1915-16.

No.	Heads of Expenditure.	Amount.	Remarks.
1	2	3	4
		Rs. a. p.	
1	Cost of College establishment	(*a*) 18,327 13 8	(*a*) (1) Four-fifths pay of Principal, Agricultural College ... 8,414 10 8
2	Cost of Hostel establishment and contingent charges	2,120 3 5	(2) His local allowance 1,200 0 0
3	Purchase of furniture and apparatus	1,027 14 1	(3) Pay of masters 6,516 0 0
4	Petty construction and repairs	298 5 8	(4) Pay of clerks 1,245 0 0
5	Games money	250 0 0	(5) Travelling allowance of Principal, Agricultural College, and his establishment. 436 3 0
6	Books for the Hostel Library	150 0 0	(6) Pay of peons, etc. 516 0 0
7	Municipal taxes, fans and light	849 10 11	Total ... 18,327 13 8
8	Expenses of students for visiting farms	315 6 0	(*b*) (1) Allowance to Hostel Superintendent 600 0 0
9	Examination charges	966 0 0	(2) Pay of Hostel chowkidar, etc. 312 0 0
10	Scholarships	2,795 12 11	(3) Pay of cooks, etc. 941 0 0
11	Other charges	787 12 6	(4) Contingent charges 267 3 5
	Total ...	27,888 15 2	Total ... 2,120 3 5

Statement showing the particulars of English classes for the year 1915-16.

Classes.	Number on the roll.	Average daily attendance.	Average on the roll.	Classification according to creed and race.						Classification according to caste.			Districts from which recruited.						Age of pupils.			Parent's occupation.						
				Musalmans.	Hindus.			Others.	Total.	Brahmins.	Others.	Total.	Bengal and United Provinces.	Berar.	Central Provinces.	Native States.	Rest of India.	Total.	Maximum.	Minimum.	Average.	Government service.	Private service.	Profession.	Trade.	Agriculture.	Miscellaneous.	Total.
					Bengali.	Maratha.	Northern Hindus.																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
3rd year ...	10	9·5	10·6	...	1	7	*Nil.*	2	10	7	3	10	1	2	5	*Nil.*	2	10	24	20	22·1	4	1	1	4	...	*Nil.*	10
2nd year ...	18	16·8	18	1	...	9	*Nil.*	8	18	9	9	18	...	*Nil.*	14	2	2	18	24	19	20·7	7	1	...	*Nil.*	9	1	18
1st year ...	31	25·05	33·4	1	...	17	*Nil.*	13	31	13	18	31	*Nil.*	3	21	5	2	31	23	18	20·3	11	1	...	*Nil.*	19	*Nil.*	31

Annual Report of the Economic Botanist, Central Provinces, for 1915-16.

The year under report has been one of steady progress in the Botanical Section. The most gratifying feature of the year's work has been the confirmation in the Northern Circle that Rice No. 12 is a distinct improvement on the local rices. The recognition of this fact by the local cultivators and the demand for seed with the corresponding increase of area under this rice is particularly pleasing. The rice in question is a high grade, good yielding, medium paddy, and is the first rice in which quality and quantity have been combined. Rices Nos. 13 and 17 have also established themselves in favour in the same tract. The spread of the cultivation of these selected rices together with the ever-increasing cultivation of the selected chillies shows how this section is benefiting the cultivators.

Agricultural Research Institute.—The accommodation for research work provided by the Institute has enabled work to be continued on extended lines. Unfortunately the specimen room had to be used as a seed room and was most unsatisfactory as rats have found their way into it. Proposals for a separate seed room and small field Laboratory were prepared during the year, but were rejected on account of war economy. The storage of large quantities of seed in a building used for other purposes is unsound in principle as it is exceedingly difficult to exclude vermin and incidently these spread to other parts of the building. In the present instance, through the drains in the Institute being left open for a long period before the building was taken over by the Department rats had already made their home in it, and this section cannot be blamed for the original invasion. With the exception of the specimen room the Institute has proved well adapted for the work for which it was designed. One minor improvement has been sanctioned during the year in the fixing of steps to the western ends of the verandahs of the Botanical and Chemical Section. These steps provide an egress to the Botanical Garden.

Rice.—Testing of selected lines of rices made slow progress. At Nagpur the pure line cultures were maintained, while 14 new early rices were tested at Adhartal (Table II). Eight of the original rices sent to that Farm for testing are still under trial (Table I). Of these No. 12 has proved a most excellent rice both as regards quality and outturn. It is now in considerable demand amongst the cultivators in that Division. No. 17 has proved a popular rice and promises to displace the early local rice.

The following tables give the outturns:—

Table I.

No. of rice.	Produce per acre in lbs.			
	1912-13.	1913-14.	1914-15.	1915-16.
8	1,406	2,200	1,208	995
11 ...	1,812	1,219	..	1,530
12 ...	1,507	1,257	1,256	2,180
13 ..	2,375	1,030	1,961	1,740
16 ...	...	803	1,987	1,141
17 ...	...	1,079	1,371	1,142
24 ..	..	1,600	1,560	916
88	...	1,964	1,546	2,087

Table II.

No. of rice.	Outturn in lbs. per acre.	No. of rice.	Outturn in lbs. per acre.
57	1,566½	91	2,354
78	1,066½	92	580
79	1,066½	95	963
83	1,555	97	673
84	1,111	100	480
86	1,541½	101	1,289
90	1,112½	103	1,403

At Raipur 14 new rices were tested. Four of the original rices sent to that Farm for trial are still being tested.

Chhattisgarh being a backward tract, at present only emerging from the state of growing rice boardcast makes less demand for improved rices, but when it reaches the stage of requiring improved lines of rice these are ready.

The following tables give the outturns:—

No. of rice.	Outturn in lbs. per acre.	
	Average outturn for four years 1911 to 1914.	1914-15.
7	720	600
11	845	360
12	971	565
13	1,115	970
New varieties.		
8	...	735
14	...	660
16	...	525
17	...	620
24	...	680
42	...	790
47	...	420
56	...	605
88	...	660
90	...	800
102	...	770

17 selected lines were tested at Sindewahi for the first time. The outturn is given below :—

No. of rice.	Average outturn in lbs. per acre.	No. of rice.	Average outturn in lbs. per acre.
7	468	17	530
8	895	24	970
9	465	33	767
11	725	42	740
12	777	43	593
13	747	47	717
14	610	50	840
16	243	56	623
		57	690

The systematic study of the wild rices of the Central Provinces was continued. It is hoped that this will be brought to a conclusion in the coming year.

Juar.—The observations on natural cross-pollination with regard to certain characters of the grains and glumes were collected and submitted to the Agricultural Research Institute, Pusa, for publication as a Memoir. During the year under report 116 crosses were made in order to study further the behaviour of certain characters.

Wheat.—The work has been continued on the same lines as last year. Numerous crosses were made at Raipur and Adhartal in the hope of improving the local wheat. Improvement by selection is also largely carried out. The selections from the New South Wales crosses were grown in pure cultures at Nagpur.

Capsicum.—The demand for seed continues to grow, and arrangements have now been made by which larger areas will be grown on the Nagpur Farm. A certain misunderstanding seems to have arisen in regard to the early round chilli. This variety is particularly suited for land which is not commanded by irrigation as it ripens on the rainfall received during the monsoon and hence requires no irrigation. Where facilities for irrigation exist it is more profitable to grow one of the later varieties. The early round chilli has, however, brought the possibility of chilli cultivation within the means of any cultivator. The classification of the varieties grown in the Central Provinces has been completed by Mr. K. P. Shrivastava, Assistant Economic Botanist, and will appear as a Departmental Bulletin.

Sann Hemp.—The seed characters of this crop have been further studied. Abundant evidence of natural crossing is present. The practice of early sowing with irrigation in garden land has been continued with success.

Cucurbitas.—Arrangements were made to grow selected seed on the Tawa River near Rampur Gurra (Hoshangabad District) a village which has escaped floods for many years. This has enabled a large quantity of seed of the Jalgaon variety of Cucumis sativus and of the Tapti Valley variety of Citrullus vulgaris to be collected.

Cotton.—An attempt has been made to isolate an early cotton for the higher portions of the Plateau Division where frost prevents the growing of ordinary varieties. Two of the selected lines which were sent to the Deputy Director of Agriculture, Northern Circle, Central Provinces, for trial are being continued.

Herbarium.—The chief additions to the Herbarium came from a fortnight's collecting tour at Pachmarhi in May. Regular collecting has been continued. A collection of specimens of the Central Provinces rices has been arranged in the Show Cases in the Herbarium. It is intended to follow this by similar collections of other important crops grown in the Central Provinces.

Botanical Garden.—The area around the Agricultural Research Institute has been handed over to this Section. The front portion will be maintained as an ornamental garden, while the portion behind the building extending to 3 acres, is being utilised for a collection of plants arranged in natural orders. Two new plant houses have been added in the Agricultural Research Institute compound, one to contain the collection of local ferns and orchids, and the other for the reference collection of foliage plants. A small propagating house with a glass roof has been erected as an experiment in order, if possible, to save the more delicate pot plants during the dryness of the hot weather. The work of transferring the plants from the old Botanical Garden behind the Victoria Technical Institute could only be started in the rains. In spite of the fact that no planting was done till the end of August the new garden has made remarkable progress. Owing to the kindness of Mr. Gammie, a very large number of new plants were introduced the majority of which have done exceedingly well. Plants were also received from the Economic Botanist, Sabour, and the Superintendent, Royal Botanical Gardens, Calcutta. An exceedingly fine collection of Cannas was presented by Mr. A. E. Lowrie, Chhindwara, and this was supplemented by the purchase of named varieties from the Agricultural-Horticultural Society, Calcutta.

A short descriptive list of the more prominent of the new additions appeared in the *Agricultural Gazette* for May. The following plants are mentioned in that publication :—

Clitoria ternata var rosea. (Pink Mussel Shell Creeper).
Yellow Daisy.
Solanum macranthum. Potato tree.
Cestrum nocturnum. Hasunan.
Maurandia spp. Climbing Toad flax.
Ruellia Blakii. (Orange Ruellia.)
Ruellia tuberosa. (Perennial Korata.)
Gmelina hystrix. (Weeping Siwan.)
Acalypha hispida. (Perennial "Love lies bleeding".)
Pennisetum rubra. Red Bajra.
Tricholæna wightii. (Satin Grass.)

Fruit Experimental Garden.—The waste land lying to the south-west of the Victoria Technical Institute has been cleared, levelled and laid out as a small Experimental Fruit Garden. Attention will mainly be given to oranges. Experiments dealing with manures, the influence of stocks, optimum quantity of water, &c., will be laid down. The chief practical interest in these experiments lies in the large area of land available for citrus cultivation under Ramtek tank. The experiments will all be of practical value. In the manurial serious attention will be concentrated mainly on locally available manures. Stocks will be tested and the best stock for each class of soil will be discovered. Introduction of other kinds of citrus fruits will be carried out as the Nagpur orange is at best a fancy orange unsuited for experiment.

Manurial Series.—The series of experiments dealing with manures has been established. The details of the manures were worked out in consultation with the Agricultural Chemist. Trees were arranged in rows. In each row there were twelve trees, and in all sixteen rows. The rows were manured with nitrogenous manures, while the lines were cross-dressed with non-nitrogenous manures. The basis of the experiment was to find out the best combination of manure at a given cost. This was taken at 2 annas per tree in the first year, rising by two annas annually to 10 annas in the fifth year, when the trees should be in bearing. The following nitrogenous manures are being experimented with :—Cattle-dung, Green manure, Caster cake, Mohwa refuse, Calcium nitrate; the cross-dressings are of Superphosphate, Potash and Superphosphate combined with Potash. The weight of manure given to each tree varies with the kind of manure and the combination used, but in every case the cost is limited to the fixed money value.

Stock Experiments.—In stock experiments it is essential to have buds taken from one scion in order to determine the influence of the stock. The following stocks have been raised and are being budded from one orange tree, the quality of whose fruit is known :—

Jambari.	Malung.	Pumelo.	Mozambique.
Kagzi.	Orange.	Wild lime.	Sweet lime.

Of the eight stocks selected to start the experiment, seed of which was sown at the same time, Malung or Rough Lemon proved the quickest, closely followed by Pumelo. The required number of budded plants for setting these lines was raised within a year. Jambari and Sweet Lime came next in order.

During the second season of these stocks in the nursery large numbers of Kagzi Sweet Lime and Mozambique died. The cause of death is being enquired into.

Further extension of this series is impossible as the reserve land for that series was taken over for Hostel extension.

Irrigation Experiments.—Two lines each of 12 trees are given water once in 10 days and when the trees require it respectively. Little or no difference is discernable.

Culture Experiments.—Two lines each of 12 trees all of the same strain have been planted to test the effect of the coldweather and hotweather flowering on the trees and also on the quality of the fruit.

Pruning Experiments.—In deference to the wishes of local orange growers a line of 12 bushy plants has been planted between two lines of single stemmed plants, one of local origin and the other purchased in order to discover the advantages, if any, of the bushy habit which is favoured by local opinion over the single stemmed plants recommended in America.

Varieties.—The following varieties have been introduced and are growing well:—

Washington Navel.	Gujaranwala.
Eureka Lemon.	Sylhet lime.
Thompson's Improved Navel.	Sylhet orange.
Royal George Navel.	Seedless lime.

Of these Washington Navel and Royal George Navel flowered.

Irrigation of Orange Trees.—The observation of last year's report, namely, that young orange trees require very little water, has been amply confirmed. In 1914-15 four irrigations were given from monsoon to monsoon, working out for the year at less than 20,000 gallons per acre. In the present year only three irrigations were necessary, *viz.*, December, March and May, the amount of water for the year being 45,000 gallons. The economy of watering in this way is immense when it is remembered that up to the present young orange trees have been supposed to require 18 to 24 irrigations. This economy is not made at the expense of the tree for the 2 years old plants are all over six feet high.

A word of caution is, however, necessary. These observations only apply to young orange gardens not yet in bearing and will probably have to be altered when fruiting begins.

Other Fruit Trees.—Varieties of mangoes, peaches, sapotas, guavas and figs have been planted in the ground available after laying out the orange experiments.

Cuttings of figs from Basra and suckers of 5 varieties of Basra Date Palms were received during the year from Captain W. T. Graham, R.A.M.C. The plants have done well.

During the present year the Indian variety of fig (*Ficus palmata*) has fruited in the garden. This is the first record of figs setting fruit in Nagpur. The method employed was at the time of flowering to place ripe fruits of any wild fig available in shallow tins amongst the branches of the fig. The wild fruits were changed once in four days. The trees were irrigated once in four days in the hot weather and fruited in June.

Banana and Plantain Cultivation.—A variety experiment was started with suckers supplied by the Overseer, Pachmarhi Gardens, to which was added a collection of all the Bombay varieties kindly sent by Mr. Gammie.

In connection with the Ramtek Irrigation Scheme an experiment was laid out to discover how bananas could be grown with infrequent waterings at least not oftener than once in 10 days. Three systems were tried (1) with the trees in shallow saucers, (2) a ridge and furrow system with the tree on the ridges, (3) the same with the plants in the furrow. The last is practically the Java system of sugarcane planting. The great advantage of either of the last two methods is that green manure or any other manure can be applied in the trenches.

Co-operative Garden Scheme, Chhindwara.—Nothing further has been done which is much to be regretted. An attempt to bring fresh fruit into Nagpur during the hot weather was undertaken in connection with the Superintendent,

Pachmarhi Gardens. Weekly consignments of plums were sent and found a ready sale amongst the Europeans in Nagpur. Indians and Anglo-Indians failed entirely to take advantage of the supply. The whole of the Chhindwara District Garden mango crop which ripens much later than the local one was sold in Nagpur at a very good price much above that offered by the fruit contractors at Chhindwara.

Guayule, Parthemium Argenteum.—The further cultivation of this plant has been stopped. The plants as usual flowered during the rains, but the seed was infertile. During the hot weather a large number of plants died and it was decided to discontinue the experiments.

Other work.—During the year seeds and plants were sent to various private individuals and institutions. As in former years the majority of the seeds distributed were selected Rices, Capsicum and varieties of Cucurbitas.

Mycology.—The most important work is breeding of rust-resistant wheats. This work is carried out in co-operation with the Deputy Director of Agriculture, Northern Circle, Central Provinces.

Publications.—"Pollination and Natural Cross Fertilization in Andropogan Sorghum, Brot" and "A Classification of the Genus Capsicum" by Mr. K. P. Shrivastava, Assistant Economic Botanist.

Tours.—113 days during the year were spent on tour. All the Experimental Farms were visited and the Board of Agriculture at Pusa was attended and a second visit was paid to Sabour. A collecting trip was made to Pachmarhi in May.

Staff.—The Staff and distribution of work remained as in the previous year.

NAGPUR:
The 27th July 1916.

R. J. D. GRAHAM,
Economic Botanist,
Central Provinces.

Report of the Agricultural Chemist, Central Provinces and Berar, for the year ending June 30th, 1916.

During the first part of the year under review I was on leave and, until my return on 22nd November 1915, Mr. Padmanabha Iyer was in charge of the current duties of the office of Agricultural Chemist. Since the submission of the last annual report, two Assistants have joined this section. Mr. D. V Bal, L.Ag., who passed out of the Agricultural College in 1913, and has since been under training at Pusa in Agricultural Chemistry and Bacteriology, has taken up his appointment of Bacteriological Assistant and is chiefly engaged in problems of soil bacteriology. Mr. A. J. Desai, B.Sc. (Bombay), joined the Department on probation on 23rd May 1916. His work will be largely confined for the present to dealing with routine analysis of soils, manures and agricultural products in general, and for the first few months he has been learning the methods of agricultural analysis. Of the former two members of my staff Mr. Padmanabha Iyer is occupied with the research work going on in the laboratory, particularly in dairy products and also has visited Tharsa, Sindewahi and Adhartal Farms for the purposes of sugarcane analysis. Mr. Ram Narayan has been responsible for the teaching in general and agricultural chemistry given to the students of the Agricultural College, and between them Mr. Padmanabha Iyer and Mr. Ram Narayan have shared the routine analytical work.

Equipment.—The new laboratories are now in full working order and are proving very satisfactory.

The gas-producing plant, which was formerly under the control of the Principal, Victoria College of Science, and supplies that College, the Agricultural College and the Agricultural Research Institute, has been taken over by the Agricultural Department and is in my charge. The Agricultural Research Institute, although smaller than similar institutions in most other provinces, is yet a very convenient building, and the general arrangement of it has been highly approved of by scientific officers of other departments and provinces.

The present conditions in Europe have made it very difficult and, in many cases, impossible to obtain laboratory stores and supplies, and the situation may become even more serious in the future. Up to the present, however, we have been able to carry on with the stock in hand supplemented by occasional supplies.

A small pot culture-house has recently been erected in the Research Institute compound and series of experiments to be carried out therein are now being framed.

Education.—During the past year two courses in chemistry and agricultural chemistry have been given, one according to the old regulations and one according to the new. The teaching was practically entirely in the hands of Mr. Ram Narayan. The report of the external examiner will be dealt with in the report of the Principal, Agricultural College.

General Analytical Work.—With improved facilities for carrying out analytical work the number of samples dealt with in the laboratory has increased during the past year by 40 per cent over the corresponding number in the previous year.

This only includes samples received in the laboratory for routine analysis and does not take into consideration a still greater volume of work coming under the heading of special investigation. The samples received for analysis during the past year are classified as follows :—

Waters	...	8
Manures	...	29
Soils	...	8
Feeding stuffs Oil-seeds and cakes	...	44
Miscellaneous	...	16
Total	...	105

It will be seen that the examination of oil-seeds and cakes forms a large part of the work coming under this section and in addition a number of oil-seed products were analysed not as food-stuffs but as manures. These analyses were made on behalf of, and in connection with, the various oil-mills working in these Provinces. Included amongst the miscellaneous samples are a number of industrial products such as lime-stone, coal, ores, etc., which were examined at the request of various officials in the Provinces.

Special Investigations.—These may be classified under the headings of major and minor. During the past year work has been continued along two lines which may be called major and a third line of work has been started. The very detailed investigation into the variations in the composition of the milk of cows and buffaloes which has been in progress in this laboratory for some time has now reached the final stage and should be completed during the current year. Observations on individual cows and buffaloes have been recorded, and the investigation has now been extended to herds of animals kept at Telinkheri Farm.

Sugarcane analysis was again carried out at Tharsa, Sindewahi and Adhartal Farms. At Tharsa further observations were made on *Sannabille* cane, and the conclusions of former years—that this cane ripens in February were confirmed.

At Sindewahi about thirty varieties of cane were analysed with a view to maintaining a record of their suitability to local conditions. The figures have been given to the Deputy Director of Agriculture, Southern Circle. An interesting point which came under notice at Sindewahi was the impossibility of preparing gur from cane grown on a certain area of land. The trouble seems to be fairly common, although not over large areas, and analysis showed that the inability of the juice to crystallise was not due to the presence of a large quantity of invert sugar. It is probably due to certain melassigenic salts in the juice, and a short note on the subject was written for the *Agricultural Gazette*, whilst it is hoped to investigate the matter still further.

At Adhartal a number of varieties differing to those grown in the south of the Provinces were analysed on two occasions during the ripening period and the results sent to the Deputy Director of Agriculture, Northern Circle. A record of the effect of different manurial treatments upon two varieties of cane was also made.

During the past year a new series of experiments has been started at Kheri near Jubbulpore to investigate some of the problems concerned with wheat growing on embanked land. The details of the experiments are given by the Deputy Director of Agriculture, Northern Circle, in his farm report. Analyses of the plots were made at intervals during the growth of the wheat crop, and it was found that the stock of nitrogen in the soil was low. Work on the subject was taken up by Mr. D. V. Bal, Bacteriological Assistant, who joined the staff towards the end of the year and already some interesting results have been obtained. As these have been submitted to the Deputy Director of Agriculture, Northern Circle, and will be included in his farm report they will not be repeated here. It will be sufficient to say that these soils apparently have considerable power to fix atmospheric nitrogen and then convert it into the form of ammonia, but that they are weak in their capacity to further convert the ammonia into nitrate.

Other subjects received attention during the year, but being of less importance or requiring a smaller amount of time being devoted to them, they can be classed as minor investigations. Amongst these, a successful method for depriving cotton seed of its hairyness or fuzz was worked out by Mr. Padmanabha Iyer during my absence on leave. By the use of alkali of the proper strength a very clean seed is obtained which is very easy to sow and loses nothing of its germinating capacity. The preparation of casein from surplus separated milk produced at the Government dairies and the manufacture of paper pulp from waste vegetable produces are other matters which have received attention and have been accomplished successfully.

Work of the Staff.—During the past year I have had the pleasure of recommending Mr. Padmanabha Iyer, my first Assistant, for promotion to the Provincial Service, as a reward for several years' hard and careful work. Mr. Ram Narayan has been very successful in his teaching and in his other hours does good work in the general laboratory, besides doing photography for the various officers of the Department. The other members of my staff are new, but I am hoping for very promising results from the bacteriological work of Mr. D. V. Bal, Assistant in that branch.

NAGPUR:
The 2nd August 1916.

F. J. PLYMEN,
Agricultural Chemist,
Central Provinces.

ENTOMOLOGICAL WORK.

Most of the entomological work done in the course of the year relates to the investigations made regarding the life history of the Rice Leaf-hopper (*Nephotettix bipunctatus*) locally known as "*maho*" and the preventive measures adopted in dealing with the outbreak of that pest in Chhattisgarh.

The Rice Leaf-hopper was first noticed by the Department in 1913, in which year it appeared late in September and did but little damage. In the following year, *i. e*, 1914, it appeared earlier and over a much larger area, and reduced the outturn of rice very considerably, more especially in Mungeli and Janjgir Tahsils in Bilaspur District, in Baloda-Bazar and Raipur Tahsils in Raipur District and in Sakti State. The Commissioner gave it as his opinion that the amount of damage done by the pest that season amounted to annas 8 in certain villages; while a loss of from 4 to 6 annas was common. The loss was so serious that the question of how best to check its ravages was taken up in earnest by the Department in 1915 in co-operation with the Commissioner and three Deputy Commissioners of the Division; for it was feared that the pest would become a permanent danger to this part of the rice tract. We were ably assisted by Mr. Fletcher, the Imperial Entomologist, who not only advised us as to the remedical measures to be tried but also sent two of his Assistants to help. Mr. Misra, his First Assistant, visited the affected area and wrote a valuable leaflet giving a brief account of the life-history of the rice-hopper and how to deal with an outbreak. Two thousand copies of this leaflet in Hindi were distributed in the Division; it was also reproduced in the *Agricultural Gazette*.

The remedial measures recommended were (1) the use of bags and light-traps and (2) the sowing of early rices in place of later ones in the areas affected. As this pest had appeared in 1913 and again in 1914, and as the damage done in the latter year had been of a serious nature in certain tahsils, it was naturally anticipated that a similar outbreak would occur in 1915—the year under report. Thousands of bags and small lanterns to be used as light-traps were therefore got ready in the hot weather and their use demonstrated and explained by an Entomological Assistant to the Tahsildars, Revenue Inspectors and Patwaris of each Tahsil and to the members of the District and Tahsil Agricultural Associations of the Division. The bags and light-traps were prepared by the orders of the Deputy Commissioners advised by the Department; the cost was met from funds provided by the District Boards. On the advice of the Commissioner four men of the Kamdar type were appointed and trained in the use of these measures for combating the pest. Two of these were posted to Bilaspur, one to Raipur and one to Drug.

The Division was divided up into two entomological circles, namely (1) Bilaspur and Sakti State and (2) Drug and Raipur. Mr. G. D. Ojha, Assistant to the Entomologist, Pusa, was in charge of the Bilaspur-Sakti Circle, while Ratiram Khamparia, Assistant Entomologist in the Department, was, on his return from leave in July, put in charge of Raipur and Drug. An Extra-Assistant Commissioner was deputed to organise the Revenue staff and to supervise operations in Raipur District.

As was anticipated the pest made its appearance about the same time and in the same tahsils as last year. The first reports were of an alarming nature and immediate steps were taken by the Department to start a campaign against it on the lines previously laid down.

I visited Bhatapara and the adjoining villages in Raipur District and also villages in Bilaspur and Janjgir Tahsils of Bilaspur District towards the end of August. To the first group of villages I was accompanied by Mr. Dewey, Extra-Assistant Commissioner. The two types of bags recommended were on this occasion put to a practical test in fields badly infested with rice-hoppers and grass-hoppers. The larger of the two bags used, which has been designated the *phaupha* bag from *phaupha*, a Chhattisgarhi word for grass-hopper, consisted of a cotton bag 4′ long, attached to a rectangular frame-work 6′×4′ made of light bamboos. This type of bag cost Rs. 2-4-0. In a trial in which it was worked by two men for four minutes over two thousand rice-hoppers and more than 100 grass-hoppers were accounted for. The area covered in this time was about $\frac{1}{10}$th of an acre. From the results of this experiment it was reckoned that by employing four men so as to have the bag worked continuously for ten hours per day, it would be possible to capture and kill from 250,000 to 300,000 rice-hoppers and over 15,000 grass-hoppers daily.

I visited Parsodi village in Bilaspur Tahsil in company with the Deputy Commissioner, Assistant Commissioner, Divisional Superintendent of Agriculture and the Entomological Assistant with a view to demonstrating the use of these bags to the people of that and adjoining villages and to Revenue Inspectors and Patwaris called there for the occasion. Six bags were worked, and large numbers of both rice-hoppers and grass-hoppers were caught. The malguzars present promised to provide the funds required for the purchase of the bags needed for their villages. The small lanterns to be used as light-traps were also tried, but proved a failure for two reasons—(1) the oil used was of the poorest bazar quality obtainable in villages and gave only a dim smoky light; (2 the pest was still in the nymph stage and the nymphs could only hop for a foot or two at a time, and were not attracted by the light. Small hand-bags similar in shape and size to an ordinary butterfly net were also tried for catching the hoppers, but proved a failure. We therefore concentrated our attention on the *phaupha* bag. Large numbers were made and used in the affected villages by the people themselves, working under the supervision of the Revenue staff. Ten bags were also supplied to each Agricultural Assistant who worked them in his Circle and reported weekly the quantity in tolas of "*maho*" captured.

Several other devices were tried. Ratiram Khamparia, Assistant Entomologist to the Department, experimented with different quantities of crude kerosene which he applied direct to the water in the rice plots. It was found difficult, however, to get the rice-hopper to come into contact with the film of kerosene; they preferred to sit on the plant itself. When driven down from their perch, they invariably hopped back again before the kerosene had time to affect them. Another device tried by some cultivators was to drive both rice-hoppers and grass-hoppers into a corner of the plot by beating the growing rice with sticks; they were then scooped up from the surface of water by means of a loin cloth (*dhoti*) worked by two men. The Department improved on this method by using a *dhoti* which had been first sprinkled with kerosene, in which case the fragile hopper was found to be killed on coming into contact with it.

All these experimental measures were tried between the middle of August and the middle of September, in villages in which the pest had appeared in very large numbers in the nymph stage. As the result of a more detailed investigation made by the Imperial Entomologist at Pusa, it was discovered that the bulk of the nymphs, all of which had at first been classed as those of the rice-hopper (*Nephotettix bipunctatus*) belonged to a different but closely related family, namely, the Fulgoridae. By the middle of September almost all the nymphs of both families had disappeared, and the few adult rice-hoppers found after that date did no appreciable damage.

The cause of the sudden disappearance of this alarming pest is hard to explain. Our District workers would fain have it believed that the prompt measure adopted in dealing with it had its effect. This, however, is extremely doubtful. It is more likely that the nymphs succumbed to the abnormally heavy rainfall of the end of August and the first half of September. Whether the steps taken in dealing with the pest were of any practical value or not, they were undoubtedly of considerable educative value and must have helped, to some extent, to dispel the ignorance and superstition of a people who still regard such visitations as being due to the wrath of their gods. In several villages our staff could not get the people to bag the insects because they had already called in and paid for the services of the insect destroyer (*baiga*), in whose *mantras* they had more faith than in the use of material appliances.

In November rice-hoppers appeared in large numbers, but by this time rice was beyond that stage at which it could be damaged. From this time till the end of the hot weather, the permanent Assistant Entomologist in the Department continued his investigation into the life-history of this insect with some degree of success. Adult hoppers were found in small numbers on thirteen different varieties of grass, and in large numbers on grasses growing in low-lying areas. The insect would therefore appear to spend its period of hibernation in the adult stage.

D. CLOUSTON,
Deputy Director of Agriculture,
Central Provinces.

Report of the Central Museum, Nagpur, for the year 1915-16.

I.—Finance.

The opening balance at the credit of the Museum Fund on the 1st April 1915 was Rs. 861-7-2. The donation made by the Government for the year under report was Rs. 4,967.

The amount credited into the Treasury during the year ending 31st March 1916 came to Rs. 274-8-6, making the total receipts under all heads Rs. 6,102-15-8.

The expenditure incurred during the year under contingencies amount to Rs. 3,448-0-4, including salaries and travelling allowances of servants paid from contingencies. The year closed with a balance of Rs. 2,654-15-4, *vide* Appendix A.

The actual expenditure incurred on account of miscellaneous and other expenditure, including salaries and travelling allowances of servants paid from contingencies, amounted to Rs. 2,828-6-4, Rs. 492 and Rs. 127-10-0, respectively, against Rs. 3,867-10 and Rs. 365-9-3 of last year.

The expenditure on salaries and travelling allowances of the permanent establishment came to Rs. 4,014-6-10 and Rs. 352-9-0, respectively.

II.—Public Rooms.

The rooms were let 11 times during the course of the year for various purposes, as compared with 13 times of the previous year. The amount thus realised was Rs. 128-4-6 against Rs. 104-0-6 of the last year. The rooms were given free of charge for meetings of the War Relief Fund, District Council and Civil Station Sub-Committee. The Public Rooms were closed during the months of December 1915, January and March 1916, as extensive repairs were being carried out in the Museum building. For part of this period the Bird Gallery was displayed in the Public Room. Thus for the first time since the Museum was built the Central Hall has been put to its true and proper use. The Hall is an ideal one for the display of Natural History specimens. It faces the main entrance to the Museum, and visitors have frequently asked why the room has not been used before as part of the Museum. Considering that the room is let not more than a dozen times in the year and brings in little more than Rs. 100 in income, the time appears to have come when the Central Room may now be reunited to the Museum. Its usefulness to the public as a place for entertainments seems to be ceased.

III.—Industrial Section.

No changes have been made in the Industrial Section, and the proposed Ethnological collection remains in abeyance on account of lack of space.

IV.—Archæological Section.

No additions were made to this Section during the year under report.

Numismatics.—The description of the Moghal coins in the Cabinet has been finished, but the completion of the catalogue is still delayed owing to the difficulties experienced in weighing and measuring the coins.

The collection in the Coin Cabinet was increased by 352 coins, which were received from various sources as detailed in Appendix B. A list of these coins (Appendix C) has been prepared, which will be a guide to those who present coins for the Cabinet.

Besides the coins for the Cabinet 487 coins (25 copper and 462 silver) were received for sale. Of these, six silver coins were removed for distribution. From the list of coins offered for sale, 127 coins were sold for Rs. 114-4-0 against 37 for Rs. 38-13-0 of last year.

From the collection of coins kept for sale, 37 were supplied free of cost to the Gwalior, Bhopal, Rewah, Dhar and Indore States as sanctioned by the Director of Agriculture and Industries, Central Provinces.

V.—Natural History Section.

Mammals.—During the year 13 mammals were added to the collection ; these include a leopard, a tree-shrew, giant squirrels and the hare (*L. Simcoxi*).

Birds.—Out of a total of 31 birds collected, ten are entirely new to the collection ; some of these are ducks and among the others the rarer ones include a bittern, a wryneck and an albino crow ; the latter was sent to us by Mr P. J. H. Stent, I.C.S. Groups of terns, coots and moorhens, pochards, ducks, bitterns and stone-plovers were set up in their natural surroundings, and the study collection of bird skins was systematically arranged in the store cases.

Reptiles.—A large mud turtle (*Trionyx sulcifrons*) which is new to science has been discovered inhabiting the tanks of Nagpur. It was found impossible to describe it from Nagpur where no literature on the subject is available and no material for comparison. The type was consequently submitted to Dr. Annandale who has described it in the Records of the Indian Museum, Volume XI, Part IV, No. 19. Two co-types remain in our Museum. A species of toad also awaits identification and may prove to be new.

Vivaria.—New additions to the vivaria have been a baby crocodile, eleven inches long, 2 water tortoises, 3 mud turtles, 2 monitor lizards and the snakes, *T. piscator*, *T. stolatus* and *N. tripudians*. All with the exception of the Cobra have maintained a healthy appearance. The earth-snakes bred in captivity viviparously and a note referring to the event has been published in the Journal of the Bombay Natural History Society, Volume XXIV, page 793. A green keelback which had been captured in December, deposited 16 eggs on two consecutive days in March.

Molusca.—A collection of the common local shells was classified, named and exhibited.

Insects.—The *Coleoptera* on exhibition have been re-arranged according to a more recent classification ; the *Lepidoptera* and *Orthoptera* have been overhauled and re-arranged, and local specimens of the *Hymenoptera* have been displayed in index form. Local dragonflies have been collected and are being worked out for us by Mr. Laidlaw. All the *Ruteline* in the Museum have been named by Mr. Arrow of the British Museum, and Mr. G. A. K. Marshall, who is in charge of the Bureau of Entomology at the same institution, has identified our weevils. The first consignment sent him contained two new species (*Tanymecus hioticeps* and *T Dabreui*) and a second consignment has since been sent to him. The carabideous fauna of the Nagpur District is being collected, and Mr. H. E. Andrewes of Highgate has very kindly offered to work on this group for us. Of the first consignment sent to him he identified and returned half, but retained the others for further examination, noting that some of them had not before been described from the East and that the Central Provinces with their adjoining tracts of country formed a region of which, from the point of view of *Carabidae*, next to nothing is known. A second consignment has since been sent to him. A few insects were sent to Pusa for identification and a few presented to the British Museum. Some ticks have also been identified by Mr. Nuttal through the Indian Museum.

Educational.—The skeleton of a frog with the bones named has been exhibited. Units of the Territorials made use of the study collection of birds and some students were given bones and skulls to study from at the Museum.

At the request of the Commissioner of Police, Wellington, a report was made by the Assistant Curator relative to the question of importing certain game birds from India to New Zealand. His sincere thanks have been recorded for the information furnished, and the report is to be laid before the Conference of Delegates of the various Acclimatisation Societies of that Dominion.

Five snakes have been sent to the Museum for identification and eight Lamellicorn beetles belonging to the Agricultural College have been named. As birds have been shot for the show cases, the contents of their stomachs have been recorded, or preserved from time to time. There are now about 400 such records and it is hoped to publish these at a later date when more of the insect fauna of the Provinces is worked up.

Tours.—The Assistant Curator inspected the Mammal Gallery of the Indian Museum in July and made two collecting tours—one to Chhindwara in January and the other in the Nagpur District in February.

Visitors.—The total number of male and female visitors for the year was 94,582 and 41,449, respectively, making a total of 136,031 against 161,627 of the last year. The average number per day was 373. From mid-day on Wednesday the galleries in the Museum are reserved for ladies.

VI.—ESTABLISHMENT.

The Museum Clerk, Mr. T. B. Garge, having gone on a month's privilege leave in June 1916, on the expiry of his leave was transferred to the office of Director of Agriculture and Industries, Central Provinces. Mr. M. A. Suboor, who in 1912, was deputed for three month's training in Numismatics under the Hon'ble Mr. H. Nelson-Wright, was appointed to the vacant post. It is hoped that this arrangement will expedite the cataloguing of the coins which has now been in progress for a number of years. The other alternative is to place Suboor on special duty until the work is completed.

Museum Extensions and Improvements.—Though progress with the schemes for extension of the Museum was delayed this year a very distinct improvement has been carried out in the original Museum Building. The unsightly iron roof has been replaced by an attractive red tile roof.

The whole of the eastern side room has now been taken into the Museum proper. The room has been fitted with cases and will contain the bird galleries, the east room thus being set free for mammals.

Temporary accommodation for the Museum office and for the Assistant Curator and his staff has been secured by blocking in the back verandah. The arrangement is most unsatisfactory.

R. J. D. GRAHAM,

Curator,

Central Museum, Nagpur.

Appendix A.

Receipts and charges under contingencies, including servants paid from contingencies and travelling allowances under the same head during the year ending 31st March 1916.

Details.	Actuals.	Total.	Remarks.
Receipts.	Rs. a. p.	Rs. a. p.	
Opening balance on 1st April 1915 ...	861 7 2	...	
Allotment for 1915-16	4,967 0 0	...	
Amount credited into Treasury	274 8 6	...	
		6,103 15 8	
Expenditure.			
Miscellaneous and other contingent expenditure, including salaries and travelling allowances of servants paid from contingencies, &c. ...	3,448 0 4	3,448 0 4	
Closing balance on 31st March 1916 ...	...	2,654 15 4	

Appendix B.

Statement showing the number of coins received in the Central Museum, Nagpur, for the Coins Cabinet, during the year 31st March 1916.

Donor.	Gold.	Silver.	Copper.	Billon.	Lead.	Total.
Indian Museum, Calcutta	...	3	...	...	...	3
Director of Agriculture and Industries, Central Provinces, Nagpur	19	131	7	...	...	157
Bombay Branch Royal Asiatic Society, Bombay..	...	2	...	...	...	2
Government Museum Madras	5	4	...	...	...	9
Nagod State through Indian Museum ..	...	...	6	...	...	6
Under Secretary to Government, United Provinces, Allahabad	1	74	20	29	...	124
Central Museum, Lahore	...	...	12	...	...	12
Government of Assam, Shillong	...	22	...	..	...	22
Superintendent, Archæological Survey, Western Circle, Poona	...	17	...	...	...	17
Total ...	25	254	44	29	...	352

R. J. D. GRAHAM,

Curator,

Central Museum, Nagpur.

Appendix C.

List of Coins received for the Coin Cabinet of the Central Museum, Nagpur, during the year 1915-16.

Serial No. and Metal.	No. of Coins.	Name of King or Description of Coins.	Mint.	Year and Date.	Donor.	Provenance.
			OTHER THAN MUHAMMADANS.			
1 Æ	1	Kacha Type of Samudra Gupta..	...	...	Director of Agriculture and Industries, Central Provinces, Nagpur.	Damoh.
2 ,,	6	Samudra Gupta ...	...	...	,, ,,	Saugor.
3 ,,	8	Chandra Gupta ...	...	...	,, ,,	Damoh.
4 ,,	1	Skunda Gupta ...	...	...	,, ,,	,,
5 ,, (base).	1	Govinda Chandra of Qannauj ...	...	...	Under Secretary to the Government, United Provinces, Allahabad.	Rai Bareli.
6 Æ	2	Padma Tankas of Southern India.	...	...	Director of Agriculture and Industries, Central Provinces, Nagpur.	Akola.
7 ,,	2	Fanam of Ganga Dynasty of Kalinganagram.	...	..	Government Museum, Madras.	Vizagapatam.
8 ,,	1 large	Ganga Fanam ...	...	...	,, ,,	,,
9 ,,	1 medium.	,, ...	...	...	,, ,,	,,
10 ,,	1 small.	,, ...	...	...	,, ,,	,,
11 Æ	3	Madanavarman of Chandella Dynasty.	...	...	Indian Museum, Calcutta	Rewah State.
12 Æ.	1	Tribal, Odumbara, Dharaghosa..	...	...	Central Museum, Lahore...	Kangra.
13 ,,	5	,, ,, Rudradosa ...	...	...	,, ,,	,,
14 ,,	1	,, ,, Sivadasa ...	...	...	,, ,,	,,
15 ,,	5	,, ,, ——— ...	...	...	,, ,,	,,
16 B.	2	Adi ? ...	...	...	Nagod Darbar, through Indian Museum.	?
			PATHANS.			
1 B	2	Muhammad Sam, Chauhan horseman and bull type.	...	...	Nagod Darbar, through Indian Museum.	?
2 ,,	2	Altamsh horseman and legend...	...	...	,, ,,	?
3 Æ	1	Allauddin Muhammad ...	Dehli ...	707	Under Secretary to the Government, United Provinces, Allahabad.	Hardoi.
4 B	1	Firoz III ...	,, ...	774	,, ,,	,,
5 ,,	1	,, ...	,, ...	785	,, ,,	,,
6 ,,	1	Bahlol Lodi ...	,, ...	893	,, ,,	,,
7 ,,	1	,, ...	,, ...	894	,, ,,	,,
8 ,,	1	Sikandar Lodi ...	Hazrat Dehli ...	896	,, ,,	,,
9 ,,	1	,, ...	,, ...	897	,, ,,	,,
10 ,,	1	,, ...	,, ...	898	,, ,,	,,
11 ,,	1	,, ...	,, ...	901	,, ,,	,,
12 ,,	1	,, ...	,, ...	902	,, ,,	,,
13 ,,	1	,, ...	,, ...	903	,, ,,	,,
14 ,,	1	,, ...	? ...	894	,, ,,	,,
15 ,,	1	,, ...	? ...	895	,, ,,	,,
16 ,,	1	,, ...	? ...	896	,, ,,	,,
17 ,,	1	,, ...	? ...	897	,, ,,	,,
18 ,,	1	,, ...	? ...	898	,, ,,	,,
19 ,,	1	,, ...	? ...	899	,, ,,	,,
20 ,,	1	,, ...	? ...	900	,, ,,	,,
21 ,,	1	,, ...	? ...	901	,, ,,	,,
22 ,,	1	,, ...	? ...	902	,, ,,	,,
23 ,,	1	,, ...	? ...	903	,, ,,	,,
24 ,,	1	,, ...	? ...	904	,, ,,	,,
25 ,,	1	,, ...	? ...	905	,, ,,	,,
26 ,,	1	,, ...	? ...	906	,, ,,	,,
27 ,,	1	,, ...	? ...	907	,, ,,	,,
28 ,,	1	,, ...	? ...	908	,, ,,	,,
29 ,,	1	,, ...	? ...	909	,, ,,	,,
30 ,,	1	,, ...	? ...	910	,, ,,	,,
31 ,,	1	,, ...	? ...	911	,, ,,	,,
32 ,,	1	,, ...	? ...	912	,, ,,	,,
33 ,,	1	,, ...	? ...	913	,, ,,	,,
34 ,,	1	,, ...	? ..	920	,, ,,	,,
35 Æ	1	Sher Shah ...	? ...	949	,, ,,	Gorakhpur.
36 ,,	1	,, ...	? ...	950	,, ,,	,,
37 ,,	1	Islam Shah ...	? ...	954	,, ,,	,,
38 ,,	1	,, ...	? ...	956	,, ,,	,,
			BENGAL.			
39 Æ	1	Ghiyasuddin Bahadur ...	Lakhnauti ...	...	Secretary to the Chief Commissioner, Assam, Shillong.	Sylhet.
40 ,,	1	Fakhruddin Mubarak, with الله	Sunargaon ...	742	,, ,,	,,
41 ,,	1	,,	,, ...	743	,, ,,	,,
42 ,,	1	,,	,, ...	744	,, ,,	,,
43 ,,	1	,, without الله	,, ...	744	,, ,,	,,
44 ,,	1	,,	,, ...	745	,, ,,	,,

Serial No. and Metal.	No. of Coins.	Name of King or Description of Coins.	Mint.	Year and Date.	Donor.	Provenance.
			BENGAL.—(*Concld.*)			
45 Æ	1	Fakhruddin Mubarak, without. الله	Sunargaon ...	746	Secretary to the Chief Commissioner, Assam, Shillong.	Sylhet.
46 ,,	1	,, ...	,, ...	747	,, ,,	,,
47 ,,	1	,, ...	,, ...	748	,, ,,	,,
48 ,,	1	,, ...	,, ...	749	,, ,,	,,
49 ,,	1	Shamsuddin Ilyas ...	Firozabad ..	A-754	,, ,,	,,
50 ,,	1	,, ...	,, ...	,, 755	,, ,,	,,
51 ,,	1	,, ..	,, ...	,, ?	,, ,,	,,
52 ,,	1	,, ...	Sunargaon ...	C-755	,, ,,	,,
53 ,,	1	,, ...	,, ...	,, 756	,, ,,	,,
54 ,,	1	,, ...	,, ...	D-754	,, ,,	,,
55 ,,	1	,, ...	Firozabad ...	E-748	,, ,,	,,
56 ,,	1	,, ...	,, ...	,, 750	,, ,,	,,
57 ,,	1	,, ...	,, ...	,, 751	,, ,,	,,
58 ,,	1	,, ...	,, ...	,, 760	,, ,,	,,
59 ,,	1	,, ...	?	?	,, ,,	,,
60 ,,	1	Sikandar bin Ilyas ...	?	A. ?	,, ,,	,,
61 Æ.	1	Muhammad bin Humayan, Bahamani.	?	?	Director of Agriculture and Industries, Central Provinces, Nagpur.	Wardha.
62 ,,	1	Abdullah Qutb Shah of Golkonda.	Haidarabad ...	1068	,, ,,	,,
			GUJRAT.			
63 Æ	1	Muhammad Shah ...	?	898	Superintendent, Archæological Survey, Western Circle, Poona.	Jambugarh State, Rewakanth Agency, Bombay.
64 ,,	1	,, ...	?	899	,, ,,	,,
65 ,,	3	,, ...	?	?	,, ,,	,,
66 ,,	1	Muzaffar II ...	Khanpur ...	92—	,, ,,	,,
67 ,,	1	,, ...	Mustafabad ...	?	,, ,,	,,
68 ,,	1	,, ...	?	924	,, ,,	,,
69 ,,	1	,, ...	?	925	,, ,,	,,
70 ,,	2	,, ...	?	926	,, ,,	,,
71 ,,	1	,, ...	?	929	,, ,,	,,
72 ,,	1	,, ...	?	92—	,, ,,	,,
73 ,,	1	,, ...	?	9 — Var.	,, ,,	,,
74 ,,	3	,, ...	?	?	,, ,,	,,
75 Æ.	1	Unknown ...	?	?	Director of Agriculture and Industries, Central Provinces, Nagpur.	Yeotmal.
			MOGHUL EMPERORS.			
1 Æ	1	Akbar ...	Ahmadabad ...	48 Azur.	Under Secretary to the Government, United Provinces, Allahabad.	Kheri.
2 ,,	1	,, ...	,, ...	982	,, ,,	Jhansi.
3 ,,	1	,, ...	,, ...	992	,, ,,	Banda.
4 ,,	1	,, ...	,, ...	999	,, ,,	,,
5 ,,	1	,, ...	Tatta ...	45 Khurdad	,, ,,	,,
6 ,,	1	,, ..	?	33 Ilahi	,, ,,	,,
7 Æ.	1	,, ...	Akbarpur ...	981	Director of Agriculture and Industries, Central Provinces, Nagpur.	Wardha.
8 ,,	1	,, ...	Lahor ...	987	Under Secretary to the Government, United Provinces, Allahabad.	Rai Bareli.
9 Æ	1	Jahangir ...	Qandhar ...	13—	Director of Agriculture and Industries, Central Provinces, Nagpur.	Saugor.
10 ,,	1	Shah Jahan ...	Ahmadnagar ...	25-1068	,, ,,	,,
11 ,,	1	,, ...	Burhanpur ...	2—	Under Secretary to the Government, United Provinces, Allahabad.	Kheri.
12 ,,	1	,, ...	Junagarh ...	23-1068	Director of Agriculture and Industries, Central Provinces, Nagpur.	Saugor.
13 ,,	1	,, ...	Patna ...	7-1043	,, ,,	,,
14 ,,	1	,, ...	Surat ...	21-1057	Under Secretary to the Government, United Provinces, Allahabad.	Kheri.
15 ,,	1	,, ...	,, ...	26-1063	,, ,,	Pilibhit.
16 ,,	1	Aurangzeb ...	Ahmadabad ...	7-1077	Director of Agriculture and Industries, Central Provinces, Nagpur.	Saugor.
17 ,,	1	,, ...	,, ...	11-1079	,, ,,	Yeotmal.
18 ,,	1	,, ...	,, ...	18-1086	,, ,,	Saugor.
19 ,,	1	,, ...	,, ...	24——	,, ,,	Yeotmal.
20 ,,	1	,, ...	,, ...	31-1099	,, ,,	,,
21 ,,	1	,, ...	Ahmadnagar ...	30-1098	,, ,,	,,
22 ,,	1	,, ...	Ajmer ...	45-1112	,, ,,	,,

Serial No. and Metal.	No. of Coins.	Name of King or Description of Coins.	Mint.	Year and Date.	Donor.	Provenance.
			MOGHUL EMPERORS.—(*Contd.*)			
23 Æ	1	Aurangzeb ...	Akbarabad ...	14-1082	Director of Agricultural and Industries, Central Provinces, Nagpur.	Saugor.
24 „	1	„ ...	„ ...	16-1084	„ „	„
25 „	1	„ ...	„ ...	28-1096	„ „	„
26 „	1	„ ...	„ ...	33-1100	„ „	„
27 „	1	„ ...	„ ...	27-1115	„ „	Yeotmal.
28 „	1	„ ...	Akbarnagar ...	33-1100	„ „	„
29 „	1	„ ...	„ ...	37-1104	„ „	„
30 „	1	„ ...	„ ...	37-1105	„ „	„
31 „	1	„ ...	„ ...	49-1117	„ „	„
32 „	1	„ ...	Aurangabad ...	30-1097	„ „	Saugor.
33 „	1	„ ...	Bareli (Bareilly) ...	46-1114	„ „	Yeotmal.
34 „	1	„ ..	Bijápur ...	34-1101	„ „	„
35 „	1	„ ...	„ ...	35-1102	„ „	Saugor.
36 „	1	„ ...	„ ...	1108	„ „	Yeotmal.
37 „	1	„ ...	Burhanpur ...	46-1114	„ „	„
38 „	1	„ ...	„ ...	49-1116	„ „	„
39 „	1	„ ...	Chinapatan ...	4——	„ „	Saugor.
40 „	1	„ ...	Golkonda ...	7-1071 (*sic.*)	„ „	Yeotmal.
41 „	1	„ ...	„ ...	14-1076 „	„ „	Saugor.
42 „	1	„ ...	„ ...	20-1076 „	„ „	„
43 „	1	„ ...	„ ...	31-1098	„ „	„
44 „	1	„ ...	Haidarabad ...	33-1100	„ „	Yeotmal.
45 „	1	„ ...	Itawa ...	34-1102	„ „	„
46 „	1	„ ...	„ ...	36-1104	„ „	Saugor.
47 „	1	„ ...	„ ...	49-1116	Bombay Branch Royal Asiatic Society.	Ahmadnagar.
48 „	1	„ ...	Jahangirnagar ..	39-1107	Director of Agriculture and Industries, Central Provinces, Nagpur.	Yeotmal.
49 „	1	„ ...	„ ...	46-1114	„ „	„
50 „	1	„ ...	„ ...	47-1114	„ „	„
51 „	1	„ ...	„ ...	47-1115	„ „	„
52 „	1	„ ...	„ ...	50——	„ „	„
53 „	1	„ ...	Junagarh ...	27-1095	„ „	Saugor.
54 „	1	„ ...	„ ...	45-1113	„ „	Yeotmal.
55 „	1	„ ...	„ ...	50-1117	„ „	„
56 „	1	„ ...	Kanbayat ...	24-1091	„ „	„
57 „	1	„ ...	„ ...	25-1095	„ „	„
58 „	1	„ ...	„ ...	28-1096	„ „	Saugor.
59 „	1	„ ...	„ ...	29-1096	„ „	Yeotmal.
60 „	1	„ ...	„ ...	30-1098	„ „	Saugor.
61 „	1	„ ...	„ ..	34-1102	„ „	„
62 „	1	„ ...	Katak ...	47——	„ „	Yeotmal.
63 „	1	„ ...	Khujistabunyad ...	32-1100	„ „	„
64 „	1	„ ...	„ ...	35-1103	„ „	Saugor.
65 „	1	„ ...	Machhlipatan ...	45-1113	„ „	Yeotmal.
66 „	1	„ ...	Patna ...	Ahd-1070	„ „	Saugor.
67 „	1	„ ...	„ ..	23-1098	„ „	„
68 „	1	„ ...	„ ...	42-1109	„ „	Yeotmal.
69 „	1	„ ...	„ ...	47-1114	„ „	„
70 „	1	„ ...	„ ...	48-1115	„ „	„
71 „	1	„ ...	Shahjahanabad ...	29-1097	„ „	„
72 „	1	„ ...	„ ...	49-1117	„ „	„
73 „	1	„ ...	Sholapur ...	22-1091	„ „	„
74 „	1	„ ...	„ ...	29-1097	„ „	„
75 „	1	„ ...	„ ...	48-1115	„ „	„
76 „	1	„ ...	„ ...	50-1118	„ „	„
77 „	1	„ ...	Surat ...	8-1076	„ „	Saugor.
78 „	1	„ ...	„ ..	10-1078	„ „	Yeotmal.
79 „	1	„ ...	„ ...	15-1083	„ „	Saugor.
80 „	1	„ ...	„ ...	15-1083	„ „	Yeotmal.
81 „	1	„ ...	„ ...	21-1089	„ „	„
82 „	1	„ ...	„ ...	22-1090	„ „	„
83 „	1	„ ...	„ ...	23-1090	„ „	„
84 „	1	„ ...	„ ...	23-1091	„ „	Saugor.
85 „	1	„ ...	„ ...	24-1092	„ „	Yeotmal.
86 „	1	„ ...	„ ...	25-1092	„ „	„
87 „	1	„ ...	„ ...	25-1093	„ „	„
88 „	1	„ ...	„ ...	29-1096	„ „	„
89 „	1	„ ...	„ ...	32-1100	„ „	„
90 „	1	„ ...	„ ...	35-1103	„ „	„
91 „	1	„ ...	„ ...	36-1104	„ „	„
92 „	1	„ ...	„ ...	38-1106	„ „	„
93 „	1	„ ...	„ ...	39-1106	„ „	„
94 „	1	„ ...	„ ...	39-1107	„ „	„
95 „	1	„ ...	„ ...	44-1112	„ „	„
96 „	1	„ ...	„ ...	45-1112	„ „	„

Serial No. and Metal.	No. of Coins.	Name of King or Description of Coins.	Mint.	Year and Date.	Donor.	Provenance.
			MOGHUL EMPERORS.—(*Concld.*)			
97 Æ	1	Aurangzeb ...	Surat ...	46-1113	Director of Agriculture and Industries, Central Provinces, Nagpur.	Yeotmal.
98 „	1	„ ...	„ ...	50-1117	„ „	„
99 „	1	„ ...	Zafarabad ...	11-—	„ „	Saugor
100 „	1	„ (Forgery) ..	? ...	44-—	„ „	„
101 „	1	Shah Alam I ...	Ahsanabad ...	2-1120	„ „	Yeotmal.
102 „	1	„ ...	Murshidabad ...	Ahd —	„ „	„
103 Æ	1	„ ...	Ellichpur ...	3-1121	„ „	Wardha.
104 „	1	„ ...	„ ...	4-11—	„ „	„
105 „	1	„ ...	?	?	„ „	„
106 Æ	1	Muhammad Shah ...	Akbarabad ...	9-1139	„ „	Saugor.
107 „	1	„ —— ...	Shahjahnabad ...	12-1142	Under Secretary to the Government, United Provinces, Allahabad.	Tehri State.
108 „	1	„ ...	„ ...	26-1157	„ „	„
109 „	1	„ ...	„ ...	27-1157	„ „	„
110 „	1	Ahmad Shah ...	„ ...	2-1162	„ „	„
111 „	1	„ ...	„ ...	3-1163	„ „	„
112 „	1	„ ..	„ ...	5-1165	„ „	„
113 „	1	Alamgir II (State) ...	Aurangnagar ...	3-——	Bombay Branch Royal Asiatic Society.	Ahmadnagar.
114 „	1	„ —— ...	Shajahanabad ..	3-(1170)	Under Secretary to the Government, United Provinces, Allahabad.	Tehri State.
115 „	1	Shah Alam II ...	Arkat ...	13-.1—	Government Museum, Madras.	Vizagapatam.
116 „	1	„ ...	„ ...	25-1200	„ „	„
117 „	1	„ ...	„ ...	27-1202	„ „	„
118 „	1	„ ...	„ ...	31-——	„ „	„
119 „	1	„ ...	Suba Awadh ...	26-1229	Under Secretary to the Government, United Provinces, Allahabad.	Hardoi.
120 „	1	„ ...	Balanagor Garha ...	27-——	Director of Agriculture and Industries, Central Provinces, Nagpur.	Saugor.
121 „	1	„ ...	„ ...	30-1202	„ „	„
122 „	1	„	„ ...	31-1202	„ „	„
123 „	1	„ ...	Chhatarpur ...	7-——	„ „	„
124 „	1	„ ...	„ ...	8-——	„ „	„
125 „	1	„ ...	„ ...	10-——	„ „	„
126 „	1	„ ...	„ ...	11-——	„ „	„
127 „	1	„ ...	„ ..	13-——	„ „	„
128 „	1	„ ...	„ ...	14-——	„ „	„
129 „	1	„ ...	„ ...	15-——	„ „	„
130 „	1	„ ...	„ ...	15 var.	„ „	„
131 „	1	„ ...	„ ...	16-——	„ „	„
132 „	1	„ ...	„ ...	17-——	„ „	„
133 „	1	„ ...	„ ...	17 var.	„ „	„
134 „	1	„ ...	„ ...	17 „	„ „	„
135 „	1	„ ...	„ ...	18-——	„ „	„
136 „	1	„ ..	„ ...	19-——	„ „	„
137 „	1	„ ...	„ ...	19 var.	„ „	„
138 „	1	„ ...	„ ...	20-1102	„ „	„
139 „	1	„ ..	„ ...	20-1129	„ „	„
140 „	1	„ ...	„ ...	21-——	„ „	„
141 „	1	„ ...	„ ...	21 var.	„ „	„
142 „	1	„ ...	„ ...	22-——	„ „	„
143 „	1	„ ...	„ ...	22 var.	„ „	„
144 „	1	„ ...	„ ...	23-——	„ „	„
145 „	1	„ ...	„ ...	25-——	„ „	„
146 „	1	„ ...	„ ...	28-——	„ „	„
147 „	1	„ ...	Kanch ..	48-——	„ „	„
148 „	1	„ ...	Rawishnagar ...	22-1194	„ „	„
149 „	2	„ ...	Sagar ...	25-——	„ „	„
150 „	1	„ ...	„ ...	26-——	„ „	„
151 „	1	„ ...	„ ...	31-——	„ „	„
152 „	1	„ ..	„ ...	32-——	„ „	„
153 „	1	„ ...	„ ...	41-——	„ „	„
154 „	1	„ ...	„ ...	47-1223	„ „	„
155 „	1	„ ...	„ ...	48-1224	„ „	„
156 „	1	„ ...	„ ...	49-1224	„ „	„
157 „	1	„ ...	„ ...	52-——	„ „	„
			AWADH DYNASTY.			
1 Æ	1	Ghaziuddin Haidar ...	Lakhnau ...	Ahd. 1235	Under Secretary to the Government, United Provinces, Allahabad.	Rai Bareli.
2 „	1	„ ...	„ ...	4-1238	„ „	„
3 „	1	„ ...	„ ...	7-1241	„ „	Lucknow.
4 „	1	„ ...	„ ...	8-1242	„ „	„

Serial No. and Metal.	No. of Coins.	Name of King or Description of Coins.	Mint.	Year and Date.	Donor.	Provenance.
			AWADH DYNASTY.—(*Concld.*)			
5 ÆR	1	Ghaziuddin Haidar ...	Suba Awadh Lakhnau.	5-1239	Under Secretary to the Government, United Provinces, Allahabad.	Lucknow.
6 Æ	1	Ghaziuddin Haidar, In name of Shah Alam II.	Lakhnau ...	26-1235	" "	"
7 "	1	In his own name ...	" ...	Ahd. 1235	" "	"
8 "	1	" ...	" ...	2-1236	" "	"
9 "	1	" ...	" ...	3-1237	" "	"
10 "	1	" ...	" ...	4-1238	" "	"
11 "	1	" ...	" ...	5-1239	" "	"
12 ÆR	1	Nasiruddin Haidar ..	Suba Awadh ...	5-1248	" "	Bareli.
13 "	1	" ...	" ...	8-1251	" "	Lucknow.
14 "	1	" ...	" ...	9-1252	" "	"
15 "	1	" ..	Lakhnau ...	0-1248	" "	"
16 "	1	" ...	" ...	6-1249	" "	"
17 "	1	" ..	" ...	7-1249	" "	"
18 Æ	1	" ...	" ...	Ahd 1243	" "	"
19 "	1	" ...	" ...	Ahd. 1244	" "	"
20 "	1	" ...	" ...	2-1244	" "	"
21 "	1	" ...	" ..	3-1245	" "	"
22 "	1	" ...	" ...	3-1246	" "	"
23 "	1	" ...	" ..	4-1246	" "	"
24 "	1	" ..	" ..	5-1247	" "	"
25 "	1	" ...	" ..	5-1248	" "	"
26 "	1	" ...	" ...	6-1249	" "	"
27 "	1	" ...	" ...	7-1250	" "	"
28 Æ	1	Muhammad Ali Shah, Type I ...	Suba Awadh Lakhnau.	Ahd. 1253	" "	Rai Bareli.
29 "	1	" II ...	" ...	Ahd. 1253	" "	"
30 "	1	" ——— ...	" ...	Ahd. 1254	" "	"
31 "	1	" Type I ...	" ...	2-1254	" "	"
32 "	1	" II ...	" ...	2-1254	" "	"
33 "	2	" ——— ...	" ...	2-1255 (Varieties).	" "	"
34 "	1	" ..	" ..	3-1255	" "	"
35 "	1	" ...	Mulk-e-Awadh Lakhnau.	3-1256	" "	"
36 "	1	" ...	" ...	4-1256	" "	"
37 "	1	" ...	" ...	4-1257	" "	"
38 "	1	" ...	" ...	5-1257	" "	"
39 "	1	" ..	" ...	5-1258	" "	"
40 "	1	Amjad Ali Shah, Type I ...	" ...	Ahd 1258	" "	"
41 "	1	" II ...	" ...	Ahd. 1258	" "	"
42 "	1	" ——— ...	" ...	Ahd. 1259	" "	"
43 "	1	" ...	" ...	2-1259	" "	"
44 "	1	" ...	" ..	2-1260	" "	"
45 "	1	" ...	" ...	3-1260	" "	"
46 "	1	" ...	" ...	3-1261	" "	"
47 "	1	" ...	" ...	4-1261	" "	"
48 "	1	" ..	" ...	4-1262	" "	"
49 "	1	" ...	" ...	5-1262	" "	"
50 "	1	" ...	" ...	5-1263	" "	"
51 "	1	Wajid Ali Shah ..	" ...	Ahd. 1263	" "	"
52 "	1	" ...	" ...	Ahd. 1264	" "	"
53 "	1	" ...	" ...	2-1264	" "	"
54 "	1	" ...	" ...	2-1265	" "	"
55 "	1	" ...	" ...	3-1265	" "	"
56 "	1	" ...	" ...	3-1266	" "	"
57 "	1	" ...	" ...	4-1263	" "	"
58 "	1	" ...	" ...	4-1267	" "	"
59 "	1	" ...	Akhtarnagar Lakhnau.	15-1267	" "	"
60 "	1	" ...	" ...	6-1268	" "	"
61 "	1	" ...	" ...	6-1269	" "	"
62 "	1	" ...	" ...	7-1269	" "	"
63 "	1	" ...	" ...	7-1270	" "	"
64 "	1	" ...	" ...	8-1270	" "	"
65 "	1	" ...	" ...	8-1271	" "	"
66 "	1	" ...	" ...	9-1271	" "	"
67 "	1	" ...	" ...	9-1272	" "	"
68 "	1	" ...	" ...	10-1272	" "	"

The Maharaj Bagh Menagerie.

General. The Menagerie has continued under the charge of P. A. Shukla, Veterinary Assistant. On account of the war none of the major improvements works contemplated have been undertaken in the year under report. The appearance of the animals and their general health has been satisfactory and their environment well looked after.

Buildings. Since the last report the following minor improvements have been completed :—

(1) Cement tanks have been made in the outer enclosures of the two larger cages and supplied with water.

(2) Cess pits have been built in the neighbouring shrubberie to deal with the washings from the cages.

(3) A fence has been erected round the Aviary to keep spectators off the cage wire.

(4) A separate Peacock house cage has been erected departmentally.

(5) A water connection has been made to the Kangaroo paddock.

Health. The general conditions of the mammals has been very satisfactory. There have been one or two losses of accidental character. In two cases deer have been injured by fighting. One panther through carelessness was permitted to be in the central changing room when the tiger was admitted to this room while its cage was being cleaned. The panther died. There has been a certain amount of illness among birds in Aviary. Avial malaria and Epetheleaum contagiosa broke out, but prompt measures were taken and the epidemics stamped out before serious mischief occurred. The only important losses were a gold pheasant and a saras.

Additions by Presentation.

No.	Kind.		From whom received.
1.	Tigress	...	Raj Nandgaon State.
1.	Nilgai	...	Mrs. Moddox, Bhusawal.
1.	Hanooman Monkey	...	Mr. Waterfall.
1.	Macoque Monkey	...	Mr. Lyon, Reserve Police Inspector.
1.	Lynx	...	Dr. Richardson.
1.	Macoque Monkey	...	Ganpat Garoo of Bhandara.

Addition by Purchase.

1 African Baboon.
1 Sulphur crested cocatoo.
2 Amazon parrots.
2 Cuban parrots
2 Gold pheasants.
2 Silver pheasants.
2 Peacocks.
3 Pigeons.
2 Kangaroos pheasants.
1 Blue yellow Macow.
12 Ducks.
4 Geese.
2 Saras.
3 Young Barasinghs.
1 Tiger.
2 Mainas.
1 Young Indian Antelope.

Addition by Births in the Zoo.

2 Sambhars.
1 Kangaroo.
4 Spotted deer.
2 Gazelle deer.
2 Four-horned deer.
3 Ducks.
5 Silver pheasants.

R. G. ALLAN,
Principal,
Agricultural College, Nagpur.

Govt. Press, Nagpur :—No. 1613, Dr. of Agri.—1-2-17—500.

Department of Agriculture, Central Provinces and Berar.

REPORT

ON THE

1. AGRICULTURAL COLLEGE, NAGPUR,
2. BOTANICAL AND CHEMICAL RESEARCH,
3. MAHARAJ BAGH MENAGERIE,

FOR THE

Year ending the 30th June 1916 1917.

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Nagpur

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1918

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3. MAHARAJ BAGH MENAGERIE,

FOR

THE YEAR 1916-17.

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College Report, 1916-17.

Work during the year.

The work of the year was considerably upset by the outbreak of plague which began in August. On account of the death of rats in the Hostel this building had to be closed and the students went home for a little over three weeks while arrangements were being made to form a camp on the Farm. Unfortunately there was unusually heavy rain in the latter part of September and the whole of October, and the camp was rendered untenable for sleeping purposes. The students returned on the day appointed : only 3—4 of the first year failed to do so and their names were struck off. Ninety-four per cent of the College, however, obeyed the summons on a letter issued to their parents explaining the state of things. This was a very satisfactory indication of confidence that danger would be avoided and the percentage attending College during the epidemic thus compares very favourably with other teaching centres in Nagpur. After their return it was found necessary, due to the lack of safety in the Hostel and the sodden character of the camp, to put the students up in the College Hall, the Research Institute Hall and the Verandahs of the Victoria Technical Institute. Lost time was made good as far as possible by abandonment of the Divali break and several holidays during the rest of the season. In spite of this there was of necessity some compression of lectures and the conditions under which work could be done out of class during the latter part of September and October were not good. This told principally on the first year who had hardly got settled into their work, when the stoppage of the course took place. The wet character of a period of this year generally fine had an adverse effect on the practical field-work of all years.

Agriculture.

This was the primary subject taken in all the three years' classes. The work of the 3rd year was in charge of the Superintendent as regards general practical control, while lectures and farm demonstration were taken by the Principal. Dairy work was largely controlled by the Dairy Overseer. The work on the farm consisted principally of Garden cultivation, Experimental plot management, Animal husbandry and Dairying. As a whole the year worked fairly well as far as the performance of practical work was concerned though the application of brains and understanding to what they were doing in the field left much to be desired in several cases.

The second year completed their work for the Diploma. On the lines of last year the subject matter was divided into two sections. Section (1) was agricultural in character covering Field agriculture, Animal husbandry and care in sickness, Dairying, Garden cultivation and Horticulture. Their work in the practical lessons was chiefly associated with these subjects. In the year under report the system of practical work in the field was changed. In the past each student cultivated a plot of *Kharif* and a plot of *Rabi*. This I came to the conclusion was unsatisfactory and not educative. In the new system the second year class work an area of some 13 acres as a definite farm, the area allows of Kharif and Rabi plots and is divided into 9 fields, which are duly cropped with strict attention to market demands, fodder, fertility and labor distribution. The bullock labor of the area is supplied by the farm and is paid for partly by the value of fodder returned to the farm, partly by permanent improvement done to the field, and if need be by cash. This prevents waste of time by students while bullocks are in use. The year is divided into two sections, each of two gangs, each gang being under the control of a gang leader selected by me from the students every week or 10 days. The post of gang leader includes certain responsibilities, but permits a good man to secure points for good work in this capacity and is therefore coveted. While an Assistant is teaching the one gang, the other is generally at some routine work on the farm under its gang leader. The system appears to work excellently, the farming of the area has improved and the students gain a much better idea of the business side of the subject.

In addition the year has about half an acre of garden land under irrigated crops, where these are grown under different systems of laying out, irrigation and the like. The year were also given a good practical Dairy course and special

instruction in Horticulture and Animal husbandry. As a whole they were a good year and the work standard was above the average. The general standard of agriculture and keenness in the subject showed a distinct improvement. The first year were carried on on the lines of last year. Their work was handicapped by plague and the season, though on the whole they were not of the standard of their predecessors as was shown by the bigger percentage of failures.

Botany and Chemistry.

In the year under report except for a few lessons given by the Chemical and Botanical staff in the first and second year courses there was no organized Botanical or Chemical teaching. This will begin again in 1917-18.

Minor Subjects.

In the third year these covered Engineering, Veterinary Science and Entomology. Though for convenience classed in the report as minor subjects, the first two rank as of first class character in the necessity required of the students in passing in each. In the second and first years minor subjects are covered under a general head in lectures termed Section II. In the first year this covers simple practical mathematics, mensuration, chain survey and elementry building construction. In the second mathematics, chain survey, mechanics and machinery and oil engines.

Engineering.

The third year had the usual two short courses in building and machinery. The former was unsatisfactory in character, as it was broken by plague to begin with, and later had to be rather hurried in character due to the departure of Mr. Cuerdon on Military service. The second course was taken by Mr. Cove (School of Handicrafts). Mechanics was taught to the year by Mr. Phatak. The second year received a course of machines and oil engines from Mr. Cove, but in the coming year I intend to improve this by giving them another short course of more practical character in the oil engine under Mr. Green of the Engineering School. The first year were given a course on Building by Mr. Rackstraw of the Public Works Department acting for Mr. Cuerdon at the Engineering School. He was assisted in the practical side of the work by a mistri. This course was of a better character than that given the first year. I am of the opinion that the appointment of an Agricultural Engineer to the Department would strengthen the character of these courses and make them more suitable in character for agricultural students. I have sanction for the appointment of an Engineer to the College Staff, but a reliable man with sufficient all-round knowledge in survey, elementry building and machanics and machines is somewhat difficult to find. In addition such a course implies the construction and fitting of carpentry and blacksmith shops which, in view of the fact that such already exist at hand in the Engineering School and School of Handicrafts and in veiw of the need of economy on account of War, I doubt, if the shortness of the courses permits or justifies, unless utilized by a Departmental Engineer for other purposes.

Veterinary Science.

The lecture side of the third year course was taken by Mr. Iyer, Assistant at the Hospital, while Mr. Shukla, the Veterinary Inspector attached to the College, controlled the practical work of this year and the course in simple animal ailment and injuries given to the second year. The subject was fairly well done. Students on the whole gave it more attention than usual. The chief difficulty in satisfactory Veterinary teaching lies in the fact that no sooner has an assistant got accustomed to teaching work, in which but few excel, than he is posted somewhere else and replaced by another man. In the present year this took place without warning and I had no idea of the change till going round the classes. To avoid this Mr. Shukla is gradually taking over more of the Veterinary teaching work each year so as to get more continuity in the nature of matter taught from year to year. A satisfactory first aid knowledge of Veterinary science is becoming most necessary as the various lines of Animal husbandry expand. In addition to what they are taught at the College, Assistants in the department should get a short Compounders' course to concentrate what they have learnt.

Entomology.

This was taught to the third year only. The general knowledge as shown by the students in the final was very much below the standard in the past. The Imperial Entomologist emphasised the necessity on the lecturers' part of realizing that he was training men who would be agriculturists and not entomologists. Their practical and field knowledge was of the greatest importance. He indicated that the result appeared to show that the year as a whole was below average rather than that the teaching was definitely defective.

Survery.

This was given in the form of a chain survey course to the first year and a revision of this with levelling to the second year. The work done was satisfactory.

Mathematics and Mensuration.

These were taken in sections 2 of the first and second year. Mr. Ghate, who was later succeeded by Mr. Chaudhari, controlled the first year, and Mr. Phatak the second year. The first year were perhaps a little below the average of the preceding first year, but the general standard is above what it was a few years ago.

General.

The courses in progress were the third year under the old curriculum, and the first and second under the new four year course. The third year were thus finishing their training for the Licenciate of Agriculture and the second year their training for the Agricultural Diploma or the first half of the course. As on the old curriculum the third year were devoting their main attention to agriculture and as this was also the case of the first and second years the amount of work thrown on the College Agricultural staff was considerable. Indeed the strain was marked and the examiner in his report laid emphasis on the fact that the staff were inadequate in numbers for the work which they should be expected to do, and thus certain items in the control of the students' work could not be done as efficiently as they might have been, if the staff allowed to the College was upto standard set and in proportion to the numbers now attending the course. It was seldom that the number of students engaged in different farm operation, demonstration, etc., on the farm was below 40. This creates a increase in the demand for bullocks and implements and is possibly one of the reasons why the general work of the farm has at times suffered.

Considered generally the third year as a whole were below the usual standard. This entry in 1914 has throughout its stay at the College been one of lower calibre. Their field work has generally been good, but their brain capacity was not very remarkable. One man was a long way above the rest. The second year was a good one and several of those who qualified for the second part of the course should do well. The first year is of rather a lower standard, though it possesses several good men and their general practical capacity with certain marked exceptions was up to standard. They, however, were distinctly handicapped by the conditions resultant from plague and may recover in the second year.

Conduct and discipline.

I have no remarks to make. Both have been satisfactory. There have been only a very few cases of attempted neglect of work and effort to evade College rules, but none of serious character.

Tours.

A large amount of touring was done, as both the third year and second year were due to visit outlying agriculture. The second year visited Labhandi in August spending their time in transplanting paddy, visiting village cultivation and seeing Chandkhuri. The third year went on tour in October visiting Raipur and district, Bilaspur, Kanti and Jubbulpore. In November both years visited Akola. While in January and March they visited Sindewahi and Hoshangabad.

College buildings.

With the exception of the furnishing or at any rate partial furnishing of the College Hall there is nothing to report.

Students.

The entry in the first year was excellent as many as 50 were admitted. Subsequent pruning out and alteration of opinions as to staying caused a reduction of the original admittance number to about 36 at the end of July. In August plague broke out. The College was disbanded. The order to return was made imperative on continuation at the College and four students failed to report on the correct day and were dismissed. Work in September began with some 31 students. Two left about Divali :—

	Beginning of year.	Appeared for examination.
1st year	36	29
2nd year	30	29
3rd year	$\frac{13}{10}$	$\frac{12}{10}$

The following gives an analysis of the areas from which students appearing for examination were drawn :—

—	Central Provinces, North and Centre.	Central Provinces, South and East.	Berar and Nimar.	Central India.	Other places.	Total.
1	2	3	4	5	6	7
1st year ...	9	6	7	4	3	29
2nd year ...	14	5	5	4	1	29
3rd year ...	4	4	...	2	2	12

The Annual Examinations, 1917.

The examinations were held from 16th to 27th March.

The list of examiners is small as Botany and Chemistry did not find a place in the course. In Agriculture the examination was conducted by Mr. Wood (Coimbatore) and the Principal. Local external examiners were impossible as the Deputy Directors, Northern and Southern Circles, were fully employed and other Agricultural officers were on Military duty or absent from the Province. Mr. Bainbrigge Fletcher examined in Entomology. Mr. Valladares (Central Provinces Civil Veterinary Department) in Veterinary science and Mr. Rackstraw (Engineering School) and Mr. Cove (School of Handicrafts) in Engineering.

Results.

First year.

Total examined.	First Class 65 per cent.	2nd Class. 50—65 per cent.	3rd Class 40—50 per cent.	Failures.
29	1	11	10	7

The examination was conducted in both sections of the course : three papers and practicals were given in the first and two papers and one practical in the second. The examination was principally conducted by the Principal, but assistance was given by the 1st College Assistant and the Superintendent of the Farm. Questions were also set by the Economic Botanist and the Agricultural Chemist. Of the failures five were Non-matric College Entrance students and two were matriculates. The results shown were very variable. There was some evidence of overcrowding of facts learnt but only partly digested, an evidence that the Lecturers had not devoted enough time to getting the class to think for themselves. In several cases bad answers were given from lack of appreciation of the drift of the questions. The practical work was generally good though more

attention should be given in demonstration to seeing that the students appreciate the value of the different adjustment points in machines. Taken as a whole the class were not as good as in 1916-17 and I do not fancy that more than 7—8 will qualify for the second part.

Second year.

Number examined.	1st division.		2nd division.	Failures.
	1st class.	2nd claas.		
29	3	10	12	.

The examination in the case of this year was on the lines of that of the first year. Three papers and practicals were given in the first section and two papers and a practical in the second section. Marks were also included for work during the term.

The first section examination was conducted by Mr. Wood and the Principal, and the second section by Mr. Cove, the Principal, and Mr. Phatak included Survey, Mathematics, Machines and Buildings. The external examiner's practical examination was principally to estimate the general work of the year and the way in which they set about any specified job. The majority of the individual marking in practical was given by the Principal or derived from observation of work during the year. The external examiner gave each student a thorough *viva voce* of a practical character. The external examiner having examined both this and the third year expresses his opinion :—"The short course men were mostly of good type and encourage one to think that they will make good students. Their average quality so far as agriculture is concerned is much better than that shown by third year. There were indications that the demonstrators in charge did not give sufficient attention to their note-books and ignorance in some cases of the cost of operations might show that they were not driven to make enquiries and keep up their observations in their note-books. All this means staff. It is not may place to offer suggestions, but Mr. Allan's staff appears weaker than that found essential at Coimbatore and several of the slight defects noted are clearly traceable to this cause—lack of sufficient individual attention."

On the whole the year however did quite satisfactorily. The defect as far as possible will be corrected in the coming year though the staff at my disposal does not permit of very close individual attention or even teaching in small groups. The second section as usual was weaker than the first section, more students coming nearer the margin of failure. On the whole however the knowledge of machines, building and survey was very fair. As a result of the examination 25 men will receive the Diploma of Agriculture, having qualified. Of these 13 were permitted to pass on to take the second part of the course for the Licenciate of Agriculture, while the balance left either to join the Agricultural Department or service in some line of agricultural character or to farm their own land.

Third year.

Number examined.	1st division.	2nd division.	Failures.
12	1	6	5

With the exception of the student in the first division, the year is of low calibre as shown by the large proportion who failed to qualify.

The examination was divided into Agriculture, Veterinary Science, Entomology and Farm Engineering.

Agriculture.—This was conducted by the same examiners as in the second year. The examiner expressed opinion that the teaching given them in the field had not been as careful or as detailed as that given the last third year he examined in 1915-16, and indicated that this was probably due to the crowded state of agricultural farm teaching in the year under report. The year as far as the majority of their field agriculture was concerned were under the Superintendent of the Farm and thus should not have suffered in this respect as the Superintendent had no other teaching. On the other hand Mr. Dhamapurkar who controlled the year has not the general farming experience possessed by his predecessor. In many respects otherwise the students of this year received the same teaching and opportunities as those of the year below them and I do not consider that their teaching has been really weaker either than that given previous third years or the present second year. As a year they were fairly diligent practical students, but were not possessed of much capacity. In agriculture 2 were first class and 5 failed.

Veterinary Science.—With some third exceptions the general knowledge shown was up to, if not above, that of past years.

Engineering.—About four students did very reasonably well and only two were failures.

Entomology.—"The results are poor on the whole and the standard knowledge seems below that exhibited in previous years. This seems to be due to the calibre of the candidates themselves, of whom eight are below par as is shown in the marks gained in the *viva voce* of the examination. From my *viva* I am led to the impression (1) that a good many students have not made full use of their opportunities given them for field work and (2) that the teaching requires to be more practical in character." The above is the external Examiner's report on the class. It bears out generally that of other Examiners of the same candidates in their second year.

Prize Winners.

Third year.

Director's prize for the best student	...	B. Subba Rao.
Choudhari Agricultural Medal	...	Ramcharanlal Farsoiya.
Veterinary Special	...	B. Subba Rao.
Kedarnath Rai Medal, Engineering	...	Ram Prasad Ahir.

Second year.

Class Prize	...	R. G. Chaurey.
Section I Prize	...	R. G. Chaurey.
Section II Prize	...	N. R. Ramayah.
Choudhari Agricultural Medal	...	Nathulal Puranchandra Varma.

First year.

Class Prize	...	Damroolal Janoria.
Section I Prize	...	Sheodayal Tiwari.
Section II Prize	...	N. D. Vyas.
Practical Agricultural Special	...	Ganpat Kesheo Saratkar.

The Hostel.

The hostel has continued under the charge of Mr. Kalka Prasad who has controlled it with his usual efficiency.

Buildings.

Considerable changes have been made since the last report, through these did not reach completion till after the close of the College year in April. They were completed in time for the 1917-18 session. During 1916-17 the hostel was overcrowded: play room, sick room and indeed any room available had to be utilized for dormitory space.

A new or third quandrangle has now been completed. This has raised the accommodation from about 66—70 students to about 110. The new quandrangle has been built to take a second story in the event of future expansion. The mess and kitchen accommodation has been overhauled and the hostel is now provided with the accommodation for 4 messes of 25 students in addition to special room for Mohamadans and those who cook for themselves. The rooms in the new quandrangle are distinctly popular. All the rooms have beem fully furnished by Messrs. Hayatt and Son. The students have undertaken the laying out and up-keep of gardens in each quandrangle. The only immediate improvement of importance which must be taken up is an extension and water connection for the night latrines.

Health.

On the whole this has been about the average. One student got plague, but he was a man who contrary to my knowledge was residing in Craddock town and not at the hostel. During the plague epedimic and on account of the heavy rain which made the camp erected unsuitable for sleeping purposes, the College students slept in the Victoria Technical Institute and Research Institute which kept clear of dead rats. All students were innoculated at the outbreak of the disease or on their return from the short absence allowed them, when the hostel first got infected.

College Agricultural Association.

Fewer meetings than usual were held on account of the fact that, to make up for time lost by the closing of College in August, Saturdays and Sundays were till after X'mas utilized for work.

College Magazine.

After a good deal of consideration it was decided to attempt a College Magazine as a means of keeping old boys who have left the College in touch with the same. The first number was issued in May and appeared to be well received. Like all such efforts it will depend on continuous support by old boys both in regard to matter for its pages and from a financial standpoint.

Games.

Further levelling has been done on the cricket and hockey ground. There were no inter-collegiate sports. In cricket the College eleven did very fairly well and in hockey interest was well sustained. In the coming year it is proposed to alter the hockey shield from a Cuptie to League games and this it is hoped will keep interest going better over the season.

College Day.

This was held as usual just before X'mas. A very fair number of old boys attended. Plays were acted in Marathi and English and the usual sports and games played. The prizes were given away by Mr. Sly, Commissioner of Nagpur, who kindly consented to preside.

R. G. ALLAN,

Principal,

Agricultural College, Nagpur.

Result of the Examination.

No.	Name.	Total third year 900.	Class.	Remarks.
1	2	3	4	5
1	B. Subba Rao ...	594	I	Director's Prize Veterinary Special.
2	Ramcharanlal Farsoiya ...	493	II	Choudhari Agricultural Medal.
3	Ram Prasad, Ahir ...	478	II	Kedarnath Rai Medal, Engineering.
4	Ambadas Shrihari Muley ...	458	II	
5	Sakharam Ghanasham Nigudkar ...	454	II	
6	Sitaram Gour ...	429	II	
7	Vithal Trimbak Dhavale ...	411	II	
8	Moolchand Dubey ...	377	Failed.	
9	Kunjilal Rawat ...	370	"	
10	S. A. Inamdar ...	367	"	
11	K. P Agre ...	365	"	
12	Y. V. Gowardhan ...	362	"	
		2nd year 700.	1st Class.	
1	R. G. Chaurey ...	439	I	Class Prize and Section I Prize.
2	N. Ramloo Ramayah ...	433	I	Section II Prize.
3	Shiv Narayan Derashri ...	432	I	
			2nd Class.	
4	Anand Dhar ...	373	I	
5	Ram Sanehi Chaube ...	372	I	
6	Baba Saloba Katey ...	371	I	
7	Kundan Lal Shrivastav ...	368	I	
8	Kirpal Singh Chima ...	356	I	
9	Nathulal Puranchandra ...	354	I	
10	Ravi Shankar Shrivastav ...	345	I	Choudhari Agricultural Medal.
11	Chunilal Goil ...	343	I	
12	K. Krishna Pillai ...	343	I	
13	Damodhar Nagorao Andharay ...	340	I	
14	Vishnu Ganesh Hardikar ...	314	II	
15	Badri Naraian Joshi ...	313	II	
16	Mohammad Majeed-ul-Haque ...	310	II	
17	Raj Bahadur Varma ...	308	II	
18	Krishnaji Sitaram Bhide ...	306	II	
19	Narayan Prasad Shrivastav ...	303	II	
20	Manoolal Goil ...	299	II	
21	Pandurang Chintaman Parihar ...	298	II	
22	Vishwa Nath Trivedi ...	298	II	
23	Aziz Mohamad Khan ...	293	II	
24	Tulsiram Amritrao Bhoge ...	293	II	
25	Damroolal Goil ...	286	II	
26	Jugal Kishore Sharma ...	284	Failed.	
27	Ambaca Prasad ...	282	"	
28	Sardar Singh ...	278	"	
29	B. D. Patil ...	244	"	
		1st year 700		
1	Damroolal Janoria ...	463	I	Class Prize.
2	Ramlal Gour ...	435	II	
3	Sheo Dayal Tiwari ...	430	II	Section I Prize.
4	N. D. Vyas ...	424	II	Section II Prize.
5	Rajaram Vyas ...	398	II	
6	P. Damodhar Nair ...	392	II	
7	K. P. Sohaney ...	383	II	
8	Lalta Prasad ...	376	II	
9	M. L. Jaiwant ...	374	II	
10	B. D. Deshmukh ...	369	II	
11	V. R. Shrivastav ...	348	II	
12	Har Prasad Gour ...	341	II	
13	A. V. Patil ...	341	II	
14	N. N. Patil ...	330	III	
15	B. N. Choudhari ...	325	III	
16	G. K. Saratkar ...	322	III	Practical Agricultural Special.
17	M. R. Muley ...	322	III	
18	K. N. Kaley ...	319	III	
19	Mir Rasul Sultan ...	316	III	
20	G. B. Patil ...	303	III	
21	G. M. Borgaonkar ...	299	III	
22	K. A. Shahapurkar ...	295	III	
23	G. B. Tizare ...	272	Failed.	
24	Gouri Shankar ...	269	"	
25	G. A. Panse ...	262	"	
26	L. B. Goswamy ...	246	"	
27	K. S. Ganu ...	241	"	
28	Mir Ahmed Sultan ...	236	"	
29	H. D. Padnekar ...	236	"	

R. G. ALLAN,
Principal,
Agricultural College, Nagpur.

STATEMENT H.—Financial Statement of the Agricultural College, Nagpur, for the year 1916-17 (*from 1st July* 1916 *to 30th June* 1917).

No.	Heads of Expenditure.	Amount.	Remarks	Amount.
1	2	3	4	5
		Rs. a. p.		Rs. a. p.
1	Cost of College establishment	(*a*)20,633 0 9	(*a*,(1) Four-fifths pay of Principal, Agricultural College ...	9,094 10 8
2	Cost of Hostel establishment	2,107 3 5	(2) His local allowance	1,200 0 0
			(3) Pay of masters	7,858 1 0
3	Purchase of furniture and apparatus	3,047 1 9	(4) Pay of clerks	1,230 6 1
4	Petty construction and repairs	993 3 0	Travelling allowance of Principal, Agricultural College, and his establishment.	717 15 0
5	Games money	250 0 0	(6) Pay of peons	532 0 0
			Total ...	20,633 0 9
6	Books for the Hostel Library	150 0 0		
			(*b*)(1) Allowance to Hostel Superintendent ...	600 0 0
7	Municipal taxes, fans and light	1,416 3 1	(2) Pay of Hostel chowkidar, etc.	312 0 0
8	Expenses of students for visiting farms	1,339 7 9	(3) Pay of cooks, etc.	972 0 0
			(4) Contingent charges...	223 3 5
9	Examination charges	750 0 0		
			Total ...	2,107 3 5
10	Scholarships	3,289 0 6		
11	Other charges	666 12 9		
	Total ...	34,642 1 0		

Statement showing the particulars of English classes for the year 1916-17.

Classes.	Number on the roll.	Average daily attendance.	Average on the roll.	Classification according to creed and race.						Classification according to caste.			Districts from which recruited.						Age of pupils.			Parent's occupation.						
				Mohamadans.	Hindus.			Others.	Total.	Brahmins.	Others.	Total.	Bengal and United Provinces.	Berar.	Central Provinces.	Native States.	Rest of India.	Total.	Maximum.	Minimum.	Average.	Government service.	Private service.	Profession.	Trade.	Agriculture.	Miscellaneous.	Total.
					Bengali.	Maratha.	Northern Hindus.																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Third year ...	10	11·5	11·4	...	...	...	...	12	12	9	3	12	...	...	8	2	2	12	25	19	22	1	3	...	...	8	...	12
Second year	29	28·6	28·4	2	...	2	2	23	29	10	19	29	...	2	21	4	2	29	25	18	21½	12	1	...	..	16	...	29
First year ...	29	27·9	27·6	2	1	4	..	22	29	10	19	29	...	6	13	7	3	29	25	17	21	7	3	...	...	16	3	29
	70	68·0	67·4																									

Annual Report of the Economic Botanist, Central Provinces, for 1916-17.

Progress has been maintained in the year under report. The extended cultivation of selected rices Nos. 12 and 17 has been continued in the Northern Circle, while Bhata Gurmatia, an early selection, promises well in the Southern Circle. The demand for the early variety of chilli has been brisk. In the Experimental Fruit Garden the orange trees began to bear when they were $2\frac{1}{2}$ years old. Upto the end of their third year the trees have only received nine waterings. The fact that the trees have fruited thus early clearly shows that the economy in water practised has in no way interfered with their well bearing. Watering of bananas once in ten days has been proved amply sufficient to give an excellent crop. The raising of seedling potatoes is a new departure in the Central Provinces and may mean much for the cultivators.

Agricultural Research Institute.—The accommodation for research work provided by the Institute has enabled work to be continued on extended lines. The proposals for a separate seed room and small field laboratory referred to in last year's report have been sanctioned and money has been allotted. The work should be completed before the "rabi" harvest.

Rice.—Testing of selected lines of rice made slow progress. At Nagpur the pure line cultures were maintained, while 9 early and medium rices were tested at Adhartal. Of these rices No. 12 continues to prove itself an excellent rice both as regards quality and outturn.

The following table gives the outturns :—

Table I.

No. of rice.	Produce per acre in lbs.				
	1912-13.	1913-14.	1914-15.	1915-16.	1916-17.
	lbs.	lbs.	lbs.	lbs.	lbs.
12	1,507	1,257	1,256	2,180	2,127
13	2,375	1,030	1,961	1,740	1,000
16	...	803	1,987	1,141	1,732
17	...	1,079	1,371	1,142	1,167
57	...	...	...	1,566	732
76	...	...	...	903	1,361
84	...	...	...	1,111	1,555
90	...	...	...	1,112	596
97	...	...	...	673	1,174
Gurmatia (standard rice) ...	...	...	...	858	1,730

At Raipur three of the original varieties were continued, while Bhata Gurmatia proved a useful early rice. Five new varieties were sent for testing, but as already pointed out Chhattisgarh is a backward tract at present only emerging from the state of growing rice broadcast, and it will be many years before they will reach the stage of requiring improved strains.

The following table gives the outturn :—

Table II.

No. of rice.	Outturn in lbs. per acre.			
	Average outturn for four years, 1911 to 1914.	1914-15.	1915-16.	1916-17.
	lbs.	lbs.	lbs.	lbs.
11	845	360	1,353	1,645
12	971	565	967	1,575
13	1,115	970	1,387	1,780
Gurmatia (Standard rice)	1,167	890	1,553	1,080
16	...	...	...	...
81	...	...	...	1,300
91	...	...	...	1,828
102	...	...	...	1,340
107	...	...	...	1,470

The testing of nine selected lines was continued at Sindewahi, while two new varieties were tested. No. 17 is a promising early rice here also, while No. 56 promises well amongst the medium rices.

The outturn is given below :—

No. of rice.	Average outturn in lbs. per acre.		
	1914-15.	1915-16.	1916-17.
	lbs.	lbs.	lbs.
11	725	1,140	1,680
12	777	1,115	1,610
13	747	1,120	1,925
16	243	...	1,370
17	530	415	1,875
33	767	930	760
43	593	760	1,998
56	623	410	2,012
Gurmatia (standard rice)	887	1,085	2,012
73	...	...	1,602
88	.	...	1,750

The systematic study of the wild rices of the Central Provinces was continued. It was impossible to complete the work in the year under report, but it is hoped that it will be brought to a conclusion in the coming year.

A detailed enquiry into the origin of awns in cultivated rices was undertaken in view of the complaints regarding the Gurmatia seed distributed from Labhandi Farm. The enquiry disclosed the fact that shortly awned plants are common in many so-called awnless rices and this probably accounts for the mixture in the Labhsandi seed. Line culture to further elucidate this problem is being carried out at Nagpur.

Juar.—The memoir on natural cross pollination in *Andropogon Sorghum* appeared from Pusa in December 1916, 15 months after it was sent for publication. A large number of the artificial crosses made in 1915 were carried forward in the present year. There is no doubt that the extreme complexity of some of the varieties is due to natural crossing and until the unit characters have been unravelled the classification of this important crop cannot be satisfactorily carried out. The characters at present under study are those of the inflorescence and the glume used by Stapf.

Wheat—Improvement by selection and breeding in wheat has been continued in co-operation with Mr. Evans. The special points aimed at are yield, stiffness of straw and rust resistance. Pusa wheats have again failed to come up to expectation and it appears they lack the vigour necessary to withstand the conditions prevailing in the great wheat-growing areas in the black cotton tracts of the Central Provinces and Berar.

Capsicum.—The arrangements made on the Nagpur Farm permitted a larger supply of seed to be raised. This was insufficient to meet the demand and arrangements have been made for increasing the supply still further. The classification of the varieties grown in the Central Provinces which was completed by Mr. Kalka Prasad Shrivastava, Assistant Economic Botanist, appears as a Departmental Bulletin in July 1916.

Sunn Hemp.—Attention is confined to the seed characters of this crop. Abundant indication of natural crossing is available.

Cotton.—Neither of the varieties selected for the higher portions of the Plateau division proved satisfactory and they have been discarded. Another early variety No. 27 with a ginning percentage of 44 is now under trial. As recommended by the Imperial Cotton Specialist attention will now be directed to staple as there is a likelihood of a demand in the near future.

Herbarium.—Regular collecting has been continued, but it has been well nigh impossible to work up the material owing to other work. A number of interesting specimens were received from Mesopotamia. These were identified as completely as possible.

Botanical Garden.—The area around the Agricultural Research Institute has been handed over to this Section. The front portion is maintained as an ornamental garden, while the portion behind the building extending to three acres has been utilised for a collection of plants arranged in natural orders. Plants were received from many sources and the orders are now well filled. The largest addition at one time was from the Economic Botanist, Sabour. A valuable collection was also received from the Royal Botanic Gardens, Calcutta. An interesting collection was received from the Arboricultural Nursery, Ramna-Dacca. The Empress Gardens, Poona, again were exceedingly generous in supplying plants.

A short descriptive article detailing the more prominent of the successful additions appeared in the *Agricultural Gazette* for April 1917. The following plants were mentioned :—

Antigonon insigne. Large flowered Antigonon.
Acacia Melanoxylon. Australian Blackwood.
Arctotis grandis.
Allamanda Schottii. Small Allamanda.
Allamanda purpurea. Purple Allamanda.
Bignonia magnifica. Magenta Bignonia.
Cardiospermum hirsutum. Balloon creeper.
Hibiscus collinus. Tree Hibiscus.
Ipomoea Learii. Perennial morning glory.
Ipomoea digitata.
Kleinhovia hospita.
Wagatea spicata. Poker shrub.

In spite of the natural slope of the land the garden behind the Agricultural Research Institute is water-logged in the rains. About three-quarters of an acre has been under-drained with porous pipes. Thanks to the early onset of the monsoon the success of the drains is already manifest. Details of the system which was worked out in consultation with the Principal of the Agricultural College are as follows. Drains were laid in parallel lines 18 feet apart. The depth of the drain at the outlet was 2 feet 4 inches and at the commencement 2 feet 9 inches. This with the natural slope of the land gave a fall of 1 in 66.

Fruit Experimental Garden.—The waste land lying to the south-west of the Victoria Technical Institute has been cleared, levelled and laid out as a small Experimental Fruit Garden. Attention is mainly given to oranges. Experiments dealing with manures, the influence of stocks, optimum quantity of water, &c., are laid down. The chief practical interest in these experiments lies in the large area of land available for citrus cultivation under Ramtek tank. The experiments are all of practical value. In the manurial series attention is concentrated mainly on locally available manures. Stocks are being tested and the best stock for each class of soil will be discovered. Introduction of other kinds of citrus fruits is being carried out, as the Nagpur orange is at best a fancy orange unsuited for experiment.

Manurial Series.—The series of experiments dealing with manures has been established. The details of the manures were worked out in consultation

with the Agricultural Chemist. Trees were arranged in rows. In each row there were twelve trees and in all sixteen rows. The rows were manured with nitrogenous manures, while the lines were cross-dressed with non-nitrogenous manures. The basis of the experiment was to find out the best combination of manure at a given cost. This was taken at 2 annas per tree in the first year, rising by two annas annually at 10 annas in the fifth year when the trees should be in bearing. The following nitrogenous manures are being experimented with: cattle-dung, green manure, castor cake, mohwa refuse, calcium nitrate; the cross-dressings are of superphosphate, potash and superphosphate combined with potash. The weight of manure given to each tree varies with the kind of manure and the combination used, but in every case the cost is limited to the fixed money value.

A large number of the trees in this series came into bearing in February. The quality of fruit when ripe will be an indication of the correct manures to use.

Stock Experiments.—In stock experiments it is essential to have buds taken from one scion in order to determine the influence of the stock. The following stocks have been raised and are being budded from one orange tree, the quality of whose fruit is known :—

Jambari.	Malung.	Pumelo.	Mozambique.
Kagzi.	Orange.	Wild lime.	Sweet lime.

Of the eight stocks selected to start the experiment, seed of which was sown at the same time, Malung or rough lemon proved the quickest, closely followed by Pumelo. The required number of budded plants for setting these lines was raised within a year. Jambari and sweet lime come next in order.

During the second year the plants budded on Jamberi forged ahead overtaking those on the Pumelo and equalling those on the Malung. The Pumelo stock now forms a poor third in the experiment.

The seedlings of Kagzi, sweet lime and Mozambique which died in the nursery were sent to the Imperial Mycologist. The cause of death was reported probably to be "Phoma macrophoma." Room for the extension of this interesting series of experiments has been provided on the Nagpur Farm and it is proposed to test the majority of the Citrus varieties found in the Citrus survey.

Irrigation Experiments.—Two lines each of 12 trees are given water once in 10 days and when the trees require it respectively. Little or no difference is discernable.

Culture Experiments.—Two lines each of 12 trees, all of the same strain, have been planted to test the effect of the cold weather and hot weather flowering on the trees and also on the quality of the fruit.

Pruning Experiments.—In deference to the wishes of local orange growers a line of 12 bushy plants has been planted between two lines of single stemmed plants, one of local origin and the other purchased in order to discover the advantages, if any, of the bushy habit which is favoured by local opinion over the single stemmed plants recommended in America.

Varieties.—The following varieties have been introduced and are growing well :—

Washington Navel	...	Eureka Lemon.
Thompson's Improved Navel	...	Royal Goerge Navel.
Gujaranwala	...	Sylhet lime.
Sylhet orange	...	Seedless lime.

Of these Washington Navel, Royal George Navel and Eureka lemon flowered and fruited.

Irrigation of orange trees.—For the year under report, the California Ring System of irrigation was abandoned in favour of an open trench System. This was carried out in consultation with the Executive Engineer, Kanhan Division.

The object of the experiment was to provide means of rapid irrigation during the cold and hot seasons and surface drainage in the rains. Trenches 15″ deep were run across the slope of the garden half way between the lines of trees. Where necessary the trenches were divided by brick and earth steps into a series of locks holding up water to a depth of 12 inches. The end of the trench was similarly blocked by a 12″ step where it joined the main drain. Water was then run into the trenches as quickly as possible, there being no danger—thanks to the steps being 3″ lower than the garden surface—of the water overflowing. Before the monsoon the steps were removed and the irrigation system converted into a drainage system.

The one disadvantage in this system is a slight one found in intercultivation. This however was easily overcome by using the small double hoe used in cotton rows—one bullock walking on either side of the trench. A single bullock hoe would be even better.

This method of open trench irrigation is not intended to supplant the ring system which under wells is undoubtedly the most economical. These trenches are only suggested for use in canal areas where the more quickly the water can be supplied the more economical it is, time being the important factor and not frequency of irrigation.

During the year under report only two irrigations were given to the garden. The majority of the fruit trees in the garden came into bearing in February, two-and-a-half years from the time of planting. This is a further proof that the economy of water is not made at the expense of the trees. Actually from date of planting to fruiting the trees had seven irrigations. A garden of the same age run by a cultivator would have received at least 36 waterings and would not be in fruit for another year.

Other fruit trees.—Varieties of mangoes, peaches, sapotas, guavas and figs have been planted in the ground available after laying out the orange experiments.

The cuttings of figs from Busra and suckers of Basra Date Palms received from Captain W. T. Graham, R.A.M.C., continued to do well. During the present year the figs refused to fruit inspite of being treated as indicated in last year's report.

Banana and Plantain Cultivation.—The variety experiment started last year was continued. All the varieties received both from Pachmarhi Gardens and from Mr. Gammie fruited. Several of the varieties are new to Nagpur and commanded a good price.

Of the methods of irrigation mentioned in last report the second, a ridge and furrow system with the trees on the ridges, was the best and was adopted throughout the area. Water was not given oftener than once in 10 days and in spite of this, possibly because of this, all the new varieties fruited. This trench system offers the additional advantage of a surface drainage system in the monsoon. As pointed out above these trenches provide the means of applying canal water quickly to an area.

Co-operative Garden Scheme, Chhindwara.—Nothing has been done in this connection. Instead, supplies of fruit and vegetables have been imported from Pachmarhi, a railway journey of nearly 24 hours plus 32 miles by road. Chhindwara is eight hours by rail with a night service. Fruit from Chhindwara and Raipur was sold

Citrus survey.—A survery of the varieties of Citrus fruits grown in the Central Provinces was undertaken during the cold weather through the kind assistance of the Superintendents of the District Public Gardens. Without their co-operation the survey would have been very imperfect and most sincere thanks are tendered to them for their assistance. In this connection it is a matter of extreme regret that the grants to District Gardens should have been curtailed. The records of the District Garden formed a most useful guide to the possibilities

of the area in which the garden was situated. Non-success was as valuable as success in an experiment and the gardens formed valuable experiment stations at a trifling cost to Government.

A further useful function was that of distributing fruit and other trees. The benefits to the cultivator were considerable: the knowlege gained for Government was valuable. It is to be hoped that the functions of the district garden will be more fully developed by increasing the grants. Centralised expert control with liberal treatment would make what has proved a useful machine into a very efficient one.

Potato Cultivation.—Experiments dealing with the introduction of varieties resistant to the bacterial rot were started at Chhindwara. Four varieties were obtained from the Economic Botanist, Punjab. For the monsoon crop a variety was obtained from Dr. Mann, Poona. In addition potatoes have been raised from seed. The seedlings did uncommonly well and next season the tubers will be planted. A large quantity of seed was collected and the raising of seedlings will be continued next year. Special thanks are due to Khan Sahib Istaq Ali, Extra-Assistant Commissioner, for his help in testing varieties in the District Garden, Chhindwara.

Other Work.—During the year seeds and plants were sent to various individuals and institutions. A collection of vegetable and field seeds was sent to Mesopotamia, this was followed by a collection of seeds of trees and lastly by flower seed. Many of the seeds did uncommonly well, but it is probable that experience and advice from the Punjab or Sind would be more useful than any which can be supplied by the Central Provinces.

Mycology.—Mycological work consisted chiefly in the collection of material which was sent to the Agricultural Research Institute, Pusa, for identification. The following specimens are of interest:—

Puccinia pruni-spinosæ. Pers. on Peach showing the teleuto stage for the first time in India.

Cercospora beticola sace. First time recorded in India.

A heavy mortality amongst the stocks in the Citrus nursery at Nagpur was attributed possibly to Phoma Macrophoma. Later in the year seedlings of lemon were attacked with a species of Rhizoctonia which did much damage. Foot rot possibly due to Fusariun limonis caused slight damage to a private orange garden at Tharsa.

The most serious outbreak of disease was in the rice crop. The disease was in every case attributed to Sclerotium Oryzæ and was reported from Raipur and Bilaspur districts in Chhatisgarh and Chanda district in Nagpur Division. Most of the diseased specimens examined belonged to the variety Gurmatia, one of the best yielding late rices. Steps are being taken to isolate a resistant variety.

Further progress was made isolating promising variety of wheat which is resistant to rust. The testing of these varieties is now carried out at Jubbulpore where rust occurs every year.

Tours.—106 days were spent on tour All the Experimental Farms were visited, but no journeys were made beyond the Central Provinces.

Staff.—Mr. V. N. Ranganath Rao returned to Mysore State service in May. With this exception the staff and distribution of work remained the same as last year.

R. J. DOUGLAS GRAHAM,

Economic Botanist, Central Provinces.

Report of the Agricultural Chemist, Central Provinces and Berar, for the year ending 30th June 1917.

Towards the end of the year under report the services of Mr. Plymen were lent to the Military Department and I was appointed to officiate as Agricultural Chemist.

The assistant staff remains at the same strength as in last year. Mr. Ram Narayan and myself have been carrying on the research work and Mr. Desai is entrusted with routine analyses of soils, manures, cakes and other agricultural products received from the various Government farms. Mr. Bal, the Bacteriological Assistant, is chiefly engaged in investigating problems of soils bacteriology and a report of the bacteriological section is attached to this report.

The Pot-culture-house has been in use since the commencement of this year. A series of experiments in connection with growth of wheat in various soils was conducted and experiments regarding green manuring are in progress.

It is only with great difficulty that the routine and research work has been carried on and in some cases work has been seriously impeded for want of suitable apparatus and chemicals, the supply of which is now quite uncertain.

Education.—There was not much teaching work to be done during the year. Only 15 lectures on chemistry had to be given to the first year students and a report on the examination was supplied to the Principal, Agricultural College, Nagpur.

General Analytical Work.—This only concerns with routine analyses of manures, cakes, etc., received from outside. The samples analysed are classified as below :—

Water	...	...	1
Manures	...	...	29
Feeding stuffs, cakes and soil seeds.		...	34
Soils	...	...	15
Miscellaneons	...	...	4
	Total	...	83

Analyses of cakes and oil seeds were done mostly for various oil mills. Ten samples of typical soils from Punjab and North-West Province were analysed for the Chief Engineer, Irrigation Branch. Mechanical and chemical analyses of the Batta soils were carried out at the request of the Deputy Director of Agriculture, Southern Circle, and the analytical figures will be found in his report on the Chandkhuri Farm.

Special Investigation.—Two assistants have been mainly engaged in completing the very detailed investigation into the changes taking place in the composition of the milk and butter fat from herds of cows and buffaloes in a full calendar year. In this connection about 500 samples of milk and ghee were analysed and the analytical figures are now ready for publication. It will be rather too lengthy to give here all the figures, but a few salient features may be noted. The Saponification, Reichert Meissl. Polenske and Kirshchner values obtained for the Indian cow and buffalo butter fat are comparatively low in hot weather and are at maximum in cold weather. Generally the above values are low as compared with the standards given for pure Danish and English butter, the maximum obtained for the cows and buffalo samples examined approaching to the minimum given for the latter. To complete this line of investigation a new series of experiments has been started towards the end of the year. The object of this experiment is to determine whether, and to what extent, the three common oil cakes (linseed cake, til cake and cotton seed cake) used as food stuffs for

milch cattle influence the amount of fat produced in the milk of such animals and also to determine the specific effect of these food stuffs upon the character of the fat. This experiment has been started with both buffalo's and cow's milk.

As in previous years analyses of Sannabile cane juice were carried out at Tharsa at intervals of one month to find out the exact time of ripening. Our observations of the previous years have been confirmed, *viz.*, this vareity matures in February.

At Adhartal about 30 varieties of canes were analysed and a series of analyses was done to determine the best suitable manure for the thin variety, Khari, and the thick varieties, striped Mauritues and Red Mauritues. The analytical figures will be found in the respective farm reports.

Some industrial problems received attention. It was proved as a result of experiment that paper pulp could be manufactured on a laboratory scale from cotton stalks. A preliminary report regarding the utilisation of green cotton stalks in the manufacture of paper pulp has been made.

A student holding the Central Provinces Scholarship for learning dye industry was entertained temporarily and worked under my supervision for three months. He carried out experiments on indigenous dyes and pigments with a view to find out whether it is feasible to establish a natural dye factory on a permanent basis or to do something at least to meet the present demand for dye stuffs. It was found that the natural colours were not bright enough to meet the public demand except in remote districts.

Bacteriological Section.—The Bacteriological Assistant joined this section only in the beginning of this year under report and as such much of his time was absorbed at the commencement in getting the apparatus arranged. Due to the present difficulties of obtaining chemicals and apparatus scientific work other than nitrification and biological analysis of soils could not be undertaken though various other lines of work were formerly under contemplation.

I. Biological Analysis of Soils.

(*a*) *Embanked Wheat Soils of Jubbulpore Tract.*—This work was undertaken with a view to finding out if the gradual deterioration of wheat yields in these soils was due to lack of any of the normal biological activities resulting from the continued practice of embanking which has been in existence in this tract for years.

Samples from the experimental plots of Kheri wheat farm were taken in the month of October 1916. These experimental plots received the following cultivation. Plot No. 1 was kept open and was ploughed at the beginninng of the rains and harrowed at intervals during the breaks of the rains. Plot VI was kept flooded with water until one month before sowing, when it was drained and one harrowing was given before sowing. Plot VII was kept flooded and no cultivation given, but the seed was sown as soon as the land was dry enough. The following conclusions can be drawn regarding these soils from this year's results :—

"With regard to the moisture content in October after heavy rains Plot VII had 44 per cent of water against 40 per cent and 35 per cent in Plots VI and I. This inequality had decreased considerably by the 10th November when the figures were 29, 23 and 23, respectively. By the 26th of January they were all uniform at 17 per cent. This rather indicates that in a year of good rainfall an unembanked field is as good as an embanked one as the soil can only hold a certain amount of water and to impound the water upon it does not make it retain any more. If the rains stopped early things might be different, but apparently about 20 per cent of moisture is what the soil wants at sowing time."

Our last year's results that nitrogen fixation and ammonification are very considerable in these soils are confirmed.

Nitrification however seems to be peculiar. The soils will apparently nitrify ammonium sulphate in solution at a fairly high temperature (86—88°F.), but will not do so at a lower temperature though the process goes to the stage of nitrite formation.

In soil medium also at lower temperatures nitrification of organic matter such as til cake is retarded though ammonification is sufficiently rapid, about 33 per cent of the organic nitrogen being converted in the form of ammonia during a period of 15 days. Further facts in this connection go to prove that reasonable doses of calcium carbonate and copper sulphate are not helpful to increase the nitrifying power. In all these cases about 3 to 5 per cent of the organic nitrogen added to the soil was converted in the form of nitrate within a period of 8 weeks.

Incubation of the soil with an organic manure at 30-33°C. increased the nitrifying efficiency to a very great extent. Still it was much below the ordinary nitrifying capacity of black cotton soils under similar conditions. Maximum amount of original nitrogen converted in the form of nitrate within a period of 8 weeks was only 50 per cent in case of Kheri soils as against 85 per cent in case of black cotton soil. The addition of adequate amount of quicklime was not in any way beneficial. Water content to the extent of 25 to 30 per cent seems to be optimum for nitrification for these soils.

There was, however, a good deal of difference in the bacterial content of the various plots. The number of bacteria as found in various samples on plating on ordinary Agar was as follows :—

Millions of Bacteria per gram of dry soil.

Date of sample taken.	20th October 1916.	10th November 1916.	26th January 1917.
Plot I	9·24	13	30
„ VI	6·25	11	11
„ VII	3·12	5	14
Nunsore soil embanked wheat field in a village near Jubbulpore.	2·22	...	...
Muriar soil, Hoshangabad	8·22	...	...

These figures also confirm our previous year's results. It is noticeable that the rise in the number of bacteria in the three plots due to the change in the season, etc., is also proportional.

Varieties of wheats from Jubbulpore and Hoshangabad were grown in pots in Jubbulpore and Hoshangabad soils, with a view to finding out, if possible, what form of nitrogen is most suited to Jubbulpore wheats in Jubbulpore soils.

The samples of Kheri soils received for this experiment were unfortunately so wet that the soil was not in a good condition for pot cultures. The growth of wheats was not therefore quite luxurious. It is clear, however, that nitrogen as ammonia on these soils has a greater effect than the same amount as nitrate. This is more marked with Kheri soils and Jubbulpore wheats than with Hoshangabad and Nagpur soils. The Jubbulpore wheats have a marked preference for ammonical nitrogen particularly on Kheri soil, but the Hoshangabad wheats have not such a definite partiality.

The outturn of wheat from the three plots at Kheri was as follows during this year, 1916-17 :—

Outturn per acre.

—	Grain in lbs.	Straw in lbs.
Plot I	750	857
„ VI	788	837
„ VII	637	723

(*b*) *Bhatta Soil.*—Samples of Bhatta soil from Chandkhuri farm were taken on 5th May 1917. Work on this soil is not yet completed. Experiments on green-manuring with Sann (*Crotalaria Juncea*) and Dhenchya (*Sesbania acubata var canabina*) are in progress.

The following tentative conclusions however can be drawn from the work done up till now :—

(1) These soils seem to be poor at nitrogen fixation as compared with the Jubbulpore and black cotton soils.

(2) Ammonification seems to be very rapid and as much as 80 per cent of the added nitrogen was found to have been converted in the form of ammonia within a period of 15 days.

(3) Nitrification also seems to be good as much as 65 per cent of the added nitrogen was converted in the form of nitrate within a period of 8 weeks as against 85 per cent in the case of black cotton soil.

(*c*) *Black Cotton Soil.*—Experiments have been started at the close of the year with a view to find out the changes in the biological conditions due to seasonal variation in kharif, rabi and fallow soil.

II.—Determination of the relative availability of the various organic manures commonly used in the Central Provinces.

This set of experiments was undertaken with a view to finding out, if possible, the relative availability of the various nitrogenous organic manures when used on different typical soils of Central Provinces. A part of this experiment concerning with the black cotton soil is just completed and the results will be duly published.

Besides these major lines of work, various other minor experiments of biological importance on the black cotton soil of Nagpur farm were conducted. Typical samples of soil from the sewage area receiving different amounts of sewage were plated with a view to estimating the bacterial content. No noticeable differences were found.

A. R. PADMANABHA AIYER,

Offg. Agricultural Chemist,

Central Provinces.

The Maharaj Bagh Menagerie.

General. P. A. Shukla, Veterinary Inspector, continued in charge of the Maharaj Bagh Zoo and of other work connected with the College and Telinkheri Farm Live-stock.

Buildings.—No maior works of any size were undertaken during the year under report.

The following smaller works were completed :—

(1) Bath and water connection has been laid on to the Bear pit and suitable cess pits constructed in the neighbouring shrubbery.

(2) Water has been laid on to the Avairy.

(3) The water gate to each of the deer paddock was reconstructed and rendered permanent in character. The work has been well done and should last for some years. Only one small water gate requires attention and will be done in 1917-18.

(4) A certain amount of levelling and controlling of water flow in the paddock has been taken in hand.

(5) The gratings over the tiger and bear pits has been strengthened.

Health.—The general condition of the mammals has been satisfactory, the majority of the deaths have arisen from injury and accidental cause, and not from ill health. The actual death-rate is much lower, nearly 50 per cent below that of 1916-17, though several valuable animals have unfortunately been lost during the year under report. An effort to mate the tiger from Bastar State with the tigress presented by Rajnandgaon resulted in the death of the latter. The pair had been kept in close connection (separated by the bars of a cage) for some months and appeared friendly. Selecting a time when the female was in heat and both had been well fed the pair were introduced to each other. After some snarling the pair looked as if they had settled down when the male made a sudden and altogether unexpected attack on the female mortally wounding her before the hose could be brought into play to separate them. An outbreak of plague occurred among the monkeys, segregation and inoculation prevented the outbreak from killing off the lot. One panther escaped from its cage and had to be shot.

Addition by Presentation and Purchase.

No.	Kind of animal.		Donor.
1.	Indian antelope	...	Honourable the Chief Commissioner.
1.	Panther	...	Raj Bahadur Raghoji Rao.
1.	Slouth Beer	...	Rao Sahib Deshpande, Ellichpur.
1.	Crested Eagle	...	The Curator, Nagpur Museum.
1.	Hymalayan Crow	...	C. G. Leftwich, Esquire.
1.	Nilgai (female)	...	Telinkheri Park.
1.	Indian antelope	...	Tahsildar, Wardha
1.	Indian antelope	...	Rai Sahib Purushottam Razu.
2.	Samber	...	D. O. Witt, Esquire.
1.	Indian antelope.	...	Do.
2	Civet Cats	...	Local purchase.

Addition by Births in the Zoo.

2 Sambar.
4 Spotted deer.
2 Four-horned deer.
2 Silver Pheasants.

R. G. ALLAN,
Principal,
Agricultural College, Nagpur.

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Department of Agriculture, Central Provinces and Berar.

REPORT

ON THE

1. AGRICULTURAL COLLEGE, NAGPUR,
2. BOTANICAL AND CHEMICAL RESEACH,
3. MAHARAJ BAGH MENAGERIE,

FOR THE

Year ending the 30th June 1918

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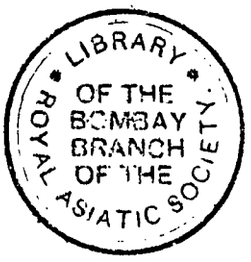

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COLLEGE REPORT, 1917-18.

WORK DURING THE YEAR.

All classes were engaged on the lines of the new Syllabus. There was no Final or Degree Examination in the year under report. The 2nd-year students were examined for the Diploma. The outline of work was essentially that noted in past Reports. The 1st and 2nd years were engaged in matters chiefly Agricultural, but covered courses of elementary character in Survey, Levelling, Building construction and a Machine course during their period of training. The 3rd-year started the more scientific side of the subject, and were chiefly engaged in Botany, Chemistry and Veterinary Science. Agriculture was kept in view by a day of farm management on the farm, control of experimental plots and short course of lectures on more advanced aspects, and by weekly discussions on subjects of agricultural interest.

AGRICULTURE.

This work continued on the lines of that of last year. The 1st-year studied the effect of soil and climate, tillage and manuring, weeding, sowing and harvest, and the general cultivation and features of the principal crops, their field work being carried on the farm at such places as allowed of the particular practical desired. In addition, arrangements were made in the College Hall to permit of the carrying out of a series of field laboratory experiments to illustrate the physical character of soil and the effects of tillage, sowing and manuring more closely. The year contained several likely and intelligent students; several, however, were poor; and I was not impressed with the working effort shown by some.

The 2nd-year carried on in their farm, worked their garden plots and attended a dairy course on the farm. They worked well, but the season was against a profitable farm year. The lecture course was similar to that of 1916-17, but more attention was given to farm management. The class did better than their first-year work indicated, though there were fewer men of First Division quality.

In the third year, as recorded earlier, Agriculture was kept in a somewhat subordinate position. Lectures were, however, given on points of management, co-operative credit and the relation of landlord and tenant. There were weekly discussions on matters of special importance covered in the early course. Practical work entailed the management of plots of experimental character and a day's work per week as subordinate farm managers.

BOTANY.

This subject was taken in the third year only. Some elementary lessons were conducted in the first-year course. The effect on the standard of the College Botany of the new course will be best observed at the conclusion of the fourth year. Mr. Kalka Prasad controlled the work.

CHEMISTRY.

Nearly the same remarks apply to the subject as to Botany. Mr. Ram Narayan was principally responsible for the work done.

VETERINARY SCIENCE.

The principal course in this was given in the third year which had a fair time for the subject on its time-table. The work was chiefly controlled by Mr. Shukla, Veterinary Inspector, and on the whole the standard shown was above that frequently the case in the past. The subject was completed in this year and the examination at the end of the year was the final and had to be passed to allow of qualification to the fourth year.

ENGINEERING.

Building construction was taken by Mr. Rackstraw of the Engineering School. Mr. Cove, of the School of Handicrafts, gave the 2nd-year students their Machine course, and a special practical course on the oil-engine was taken by Mr. Green, of the Engineering School, with the 3rd-year students. This was a new course. The courses appear to have been satisfactorily attended.

SURVEY, MECHANICS AND MATHEMATICS.

Courses in the first-named were given in both the first and second years. The former principally Chain Survey ; the latter included Levelling. The students had an opportunity of putting into practice some of their contour level work by assisting in the lay-out of an under-drainage system. Mr. Khare was responsible for the class. Mechanics and Mathematics were controlled by Messrs. Phatak and Choudhari, the latter subject being chiefly Mensuration and applied farm arithmetic.

ENTOMOLOGY.

Little of the subject was done. The usual short course was included in the second year programme. The advanced course in Entomology is reserved till the fourth year of the course.

GENERAL.

It is somewhat early to speak of the work of the third year, as the year forms but a part of what is to be completed next year. Generally, however, their work appears to have been fairly satisfactory, and there is, at any rate, a fair prospect of some seven or eight students out of a year of 12 attaining their degrees next January. The 2nd-year improved on their first-year showing, and their general standard of work was good, though a smaller number qualified for promotion in the 1st Division. The first-year, as usual, showed very varied talents.

There will be some slight alteration necessary in the Syllabus and Curriculum during the next year.

Mathematics will be increased in the first year and a definite course of English instruction introduced. In the second year there will be slight decrease in the time in the field, while work in Physics and Botany, as definite subjects and as preparatory for the third and fourth years, to relieve the pressure in these years, will be introduced. More time will also be given to Mechanics and Anatomy and Physiology. At present the last-named is dealt with in Section I of first year, but too lightly to be a sufficient base for the Veterinary study of the third year. It will therefore be dropped in the first year and be included as a special two-periods-per-week subject in the second year, thus making it more valuable in the First Aid Veterinary course given in the second year, and as a foundation for the Veterinary Science of the third year.

There is at present a very sharp line between a 1st Division and 2nd Division pass ; at the end of the second year the former is qualified to proceed to a degree ; the second gets his diploma and leaves the College, having no further hope of a degree. During the passed two years there has been a very distinct mark-gap between the bottom of Division 1 and the top of Division 2 ; but at times this will not be so clear, and at times a student who is really worth the 1st division may make an unexpected mess of his papers. While realizing that the value of the degree depends on the difficulty of getting it, and with no intention of materially lowering its value by increasing the ease of getting it, I am becoming of the opinion that the end of the first year would form a better point of division. At this stage students could be classed as eligible to try for the diploma or for the degree. Those eligible for the latter would have a course with possibly a little more elementary science than that proposed for the second

year 1918-19; and the former a little less. The students eligible for the degree would take their final of Part I at the end of the second year. If placed in Division 1, they would proceed to Part II; if placed in Division 2, they would be allowed to repeat the 2nd year once, if they desired; and if in Division III, they would receive the diploma similar to that given to those who had been placed in the diploma examination section at the end of the first year and had qualified therein, but would not be allowed a second attempt to qualify for promotion to the second part. These alterations would not affect the value of the diploma course as a sound Agricultural one of practical character or the general value of the men turned out; but it would permit of a slightly greater possibility of a degree and would permit the easier affiliation of the College to the future Central Provinces University by making the early part of the degree course more liberal in character and less technical:

The High School Agricultural Department scholarships have not yet begun to show very much return in the form of Matriculates from the agricultural castes appearing at the College. Up to date the average per year works out at rather less than one.

Conduct and discipline.

Both of these have been satisfactory. The College was uninfluenced by the wave of 'strikes' which swept through the majority of the Colleges and Schools of Nagpur during the past year. The fact that they have less connection with Nagpur and are more fully occupied, together with the good influence of the staff and senior students, were chiefly instrumental in keeping them clear of scandalous folly. The damage done to the participators, in many cases the luckless victims of unscrupulous instigators, was only too apparent in the University examination results as in evidence in Nagpur, and materially reduced the number eligible for entrance to the College in July 1918.

A certain section of the 1st-year students were not up to the standard of field effort expected in the College.

Tours.

The 2nd-year visited Raipur, Akola, Sindewahi, Adhartal and Hoshangabad.

College Building.

There has been no marked addition. It is hoped, however, that the Agricultural educational grant will allow of an alteration of the present entomological section into a laboratory for survey and agricultural work, the removal of the entomological section to a fresh site on the farm near the botanical field laboratory, and the fitting up of the present survey and drawing room as a class room. With four years in the College, these extensions are necessary. An extension to the dairy to improve its teaching facilities is also contemplated. The College Hall was distempered and the platform filled with a proscenium. The old granary on the farm has been slightly altered, and is now to be used as a field work room on wet days.

The entry into the first year at one time looked as if it was going to be a record, the number of applications and acceptances being much heavier than usual and the type of students good. The number, however, fell away, by departure and elimination after joining, to 36. Ten students were admitted on the College Entrance Examination. As usual, there was a big difference between the top and bottom. The year, however, contains a number of likely men :—

	Beginning.	Appeared for Examination.
1st year	36	31
2nd year	28	27
3rd year	12	12

The following is the usual analysis to show area of recruitment:—

	North Central Provinces.	South and and East Central Provinces.	Nagpur and Wardha.	Berar.	Central India.	Other places.	Total.
1st year ..	20	3	2	...	5	...	30
2nd year ..	10	5	1	3	4	4	27
3rd year ...	5	2	2	...	2	1	12

Annual Examination.

The examinations were held between the 16th and 26th March.

They were conducted by the following:—

Agriculture	...	Mr. Knight (Poona) and the Principal.
Veterinary Science	...	Mr. Wilson (Central Provinces Civil Veterinary Department).
Chemistry	...	Agricultural Chemist.
Botany	..	Agricultural Botanist.
Engineering and Mathematics Survey.		Mr. Cove (School of Hindicrafts). Mr. Rackstraw (Engineering School and Messrs. Phatak and Khare (Agricultural College).

Result.

First Year.

Total examined.	First Class, 65 per cent.	Second Class, 50—65 per cent	3rd Class, 40—50 per cent.	Failures.
30	8	6	8	8

The Class was examined in the two Sections in which teaching is divided, *i. e.*—Section I, principally Agriculture and Elementary Popular Science associated with it; Section II Mathematics, Survey and Building. The examination in Section I was conducted in practical by the Principal and Superintendent of the Farm, while the written papers were set by the Principal and two Assistant lecturers, with the addition of questions from the Agricultural Chemist and Economic Botanist. Four students failed to qualify. In the mathematical section there were six failures. The majority of the failures came down in both subjects. With the exception of the bottom half dozen men the general standard of the year was satisfactory in both Sections. Of the failures, 5 were non-matrics, and 3 matriculates.

Second Year (Diploma).

Total examined.	1st Division.	2nd Division.	Failures.
27	9	11	7

The Class was examined on the same lines as the above. The majority of the examination in Section I was conducted by Mr. Knight, Poona, assisted by the Principal. Section II was examined by Messrs. Cove, Rackstraw and Phatak. A rather high percentage failed to qualify for a degree, and the number in the 1st Division was less than last year. In three cases failure occurred in Section I and in three in Section II. The students apart from the failures did fairly well and showed a sound knowledge of Theoretical and Practical Agriculture. The chief weakness was shown in the second paper in Section II, as here the students did not appear to realize that a knowledge of building was needed of them, though not taught that year and revision was wanting in a number of cases.

Third Year.

Examined.	1st Division.	2nd Division.	Failures.
12	...	10	2

This examination, with the exception of Veterinary Science, which was a final, was chiefly a qualifying examination to see which studends could be safely allowed to proceed to the final, having, at any rate, mastered the elements of the two principal sciences taught them.

In this respect two failed to do so ; one failed in Veterinary Science, and the other showed no indication of having grasped what Chemistry meant. Of those that passed, none quite reached a 1st class standard, though three came very near doing so, and two were distinctly weak. The final subject, Veterinary, was conducted by the external examiner, Mr. Wilson. The other three subjects examined, *viz.*, Agriculture, Botany and Chemistry, were taken by the local staff. On the whole the standard of the year hardly, reached my expectations of them.

Agriculture	...	2 did reasonably well	... 4 were near the line of failure.
Botany	...	1 did well	... 4 reasonably well.
Chemistry	...	3 did reasonably well	... 3 were weak and 1 a bad failure.
Veterinary	...	6 did well	... 3 were weak and 1 a failure.

Prize Winners.

Second Year.

Class Prize	...	Damroolal Janoria.
Section I Prize	...	Do.
Section II Prize	...	N. D. Vyas.
Parctical Agriculture, Special	...	Ramlal Gour.
Kedarnath Rai Medal for Agricultural Engineering.		Sheo Dayal Tiwari.

First Year.

Class Prize	...	A. N. K. Biswas.
Section I Prize	...	G. R. Gokhle.
Section II Prize	...	Shadilal Shriwastava.
Practical Agriculture, Special	...	Shyamlal Tiwari.

College Prize.

The Coronation Medal	...	R. G. Chaurey.
The Napier Essay Prize	...	P. D. Nair.

THE HOSTEL.

Mr. K. P. Shrivastav continued in charge as Superintendent throughout the year. Prefects were elected for the first time. Three students of the 3rd year, R. G. Chaurey, B. S. Katey and Sheo Narayan Derashri, in last Report, were selected for this honour.

Buildings.

The new quadrangle in construction came into use this session. The rooms are slightly larger and better ventilated and roofed and the area is popular. The students undertook the lay-out and cultivation of a garden plot in second and third quadrangles during the year. The building is lit throughout with electricity. The whole is now fully furnished. With the completion of the extension and improvement of the night latrine, there is little, except possibly the erection of a small separate grain store, needed to make the Hostel complete for some years to come.

Health.

There was no great outbreak of plague this year in the city. The skeleton of a plague camp was, however, erected on the play-ground as a precaution. In future this will be erected every year after October. The general health was satisfactory, apart from a rather increased amount of malaria.

The College Agricultural Association.

This Society had a very good year. A number of papers were read, and attendance was, on the whole, good.

College Magazine.

This year an attempt has been made to start a College Magazine as a permenant record of College life and as a link with the old boys. Its existence will largely depend on the support given by the last.

College games and social life.

The games were in a more satisfactory state than last year. Football was played, and College raised a very fair team. Hockey was played on the League principle instead of the Cup Tie. This gave each competition about 10 games. The College, on the whole, did quite well. Apart from poor play in two matches which lost them points, their general effort was good. We did not shine in the Inter-Collegiate Sports. In this the absence of numbers tells.

The Kartar Singh Medal was awarded to Kripal Singh for all-round ability and keenness. The ground got further attention and levelling.

The College day was celebrated on 5th and 6th December, as the Principal had to attend the Agricultural Board and examine at Coimbatore. The usual dramatic performance (given on this occasion for the " Our Day " Fund), sports and prize giving marked the event. The College was honoured at the last mentioned by having the Hon'ble the Chief Commissioner as the principal guest. This is the first time that we have had this honour. The Chief Commissioner at the conclusion of the speeches gave away the prizes.

R. G. ALLAN,
Principal,
Agricultural College, Nagpur.

Results of Annual Examinations, 1918.

No.	Names.	Total.	Division.
	Third Year.		
		550	
1	R. G. Chaurey	349	II
2	N. R. Ramaiyah	346	II
3	B. S. Katey	342	II
4	Ram Sanehi	324	II
5	Ravi Shankar	319	II
6	S. N. Derashri	318	II
7	Anand Dhar	298	II
8	Kundanlal	281	II
9	K. K. Pillay	266	II
10	D. N. Andharey	264	II
11	N. L. Verma	267	Failed.
12	Kripal Singh	250	,,
	Second Year.		
		725	
1	Damrdolal Janoria	473	I
2	N. D. Vyas	443	I
3	Rajaram Vyas	438	I
4	Sheo Dayal	435	I
5	K. P. Sohane	425	I
6	Ramlal Gour	403	I
7	P. D. Nair	398	I
8	Mulchand Dubey	395	I
9	Lal Singh	390	I
10	Lalta Prasad	378	II
11	Vaikunthrai	376	II
12	S. A. Inamdar	375	II
13	N. N. Patil	375	II
14	B. D. Deshmukh	372	II
15	K P. Agre	369	II
16	Sirdar Singh	367	II
17	Har Prasad Gour	361	II
18	Mir Rasool Sultan	338	II
19	G. K. Saratkar	336	II
20	B. D. Patil	313	II
21	K. N. Kaley	308	Failed.
22	Gulab Rao Patil	306	,,
23	B. N. Choudhari	302	,,
24	G. M. Borgaonkar	300	,,
25	M. R. Muley	299	,,
26	K. P. Shahpurkar	297	,,
27	M. A. Sultan	279	,,

No.	Names.	Total.	Division.
	First Year.	700	
1	A. N. K. Biswas	484	I
2	G. R. Gokhale	464	I
3	Bhola Prasad Nema	460	I
4	Shyamlal	454	I
5	Mangilal Agarwal	442	I
6	Shadilal	440	I
7	Balkrishna Dubey	432	I
8	Ram Narayan Dubey	423	I
9	Hanmantrao Muluk	407	II
10	Dhannalal	404	II
11	Shrikant Misra	403	II
12	Damrilal Choudhari	375	II
13	Y. M. Parnerkar	374	II
14	S. M. Deo	366	II
15	R. N. Richaria	361	III
16	Moghe	360	III
17	Motilal Vaishya	337	III
18	A. P. Shende	344	III
19	S. G. Joshi	353	III
20	Dhansingh Gour	330	III
21	C. V. Pant Vaidya	312	III
22	Umrao Prasad	310	III
23	Ram Gopal	324	Failed.
24	D. G. Joglekar	322	"
25	D. G. Kuralkar	216	"
26	Krishnarao Naidu	291	"
27	K. G. Baxi	220	"
28	K. P. Chobey	303	"
29	B. R. Choudhari	235	"

STATEMENT H.—Financial Statement of the Agricultural College, Nagpur, for 1917-18, *from* 1st *July* 1917 *to* 30th *June* 1918.

Heads of Expenditure.	Rs.	a.	p.
1. Cost of College Establishment	(*a*) 22,028	13	4
2. Cost of Hostel Establishment and Contingent Charges ...	(*b*) 2,196	9	6
3. Purchase of Furniture and Apparatus	1,993	11	0
4. Petty Construction and Repairs	350	15	3
5. Games Money	250	0	0
6. Books for the Hostel Library	150	0	0
7. Municipal Taxes, Fans and Lights	1,194	5	1
8. Expenses of Students for visiting Farms ...	1,033	15	3
9. Examination Charges	550	0	0
10. Scholarships	3,762	0	6
11. Other Charges	1,094	14	0
Total ...	34,605	3	11

Heads of Expenditure.	Rs.	a.	p.
(*a*) (1) 4/5ths Pay of Principal, Agricultural College ...	9,374	6	5
(2) His Local Allowance	1,200	0	0
(3) Pay of Masters	9,074	15	2
(4) Pay of Clerks	1,193	10	3
(5) Travelling Allowance of Principal, Agricultural College, and his Establishment.	549	13	6
(6) Pay of Peons	636	0	0
Total ...	22,028	13	4
(*b*) (1) Allowance to Hostel Superintendent ...	600	0	0
(2) Pay of Hostel Chaukidars	312	0	0
(3) Do. of Cooks, etc.	888	0	0
(4) Contingent Charges	396	9	6
Total ...	2,196	9	6

Statement showing the particulars of English Classes for the year 1917-18.

Classes.	Number on the Roll.	Average daily attendance.	Average on the Roll.	Classification according to creed and race.						Classification according to caste.			Districts from which recruited.						Age of pupils.			Parents' occupation.						
				Muhammadans.	Hindus.			Others.	Total.	Brahmins.	Others.	Total.	Bengal or U. P.	Berar.	Central Provinces.	Native States.	Rest of India.	Total.	Maximum.	Minimum.	Average.	Government service.	Private service.	Profession.	Trade.	Agriculture.	Miscellaneous.	Total.
					Bengalees.	Maratha.	Northern Hindus.																					
Third year ...	12	11·15	12	...	...	6	...	6	12	6	6	12	...	...	9	2	1	12	28	20	24	4	1	...	...	7	...	12
Second year.	27	26·4	28	2	...	10	...	15	27	10	17	27	...	3	16	6	2	27	27	18	22·5	8	1	...	...	16	2	27
First year ...	30	28·6	34	...	15	15	...	...	30	15	15	30	...	...	25	5	...	30	22	18	20	8	5	...	3	14	...	36
Total ...	69	66·5	74	2	...	31	...	31	69	31	38	69	...	3	50	13	3	69	26	19	22·5	20	7	...	3	37	2	39

Annual Report of the Economic Botanist, Central Provinces, for the year 1917-18.

Staff.—Consequent on the deputation of Dr. Graham to Mesopotamia on military duty in November last, I was appointed to officiate as Economic Botanist in addition to my own duties. The other changes in the staff consisted in the appointment of Mr. P. G. Deshpande, a passed student of the Agricultural College, Nagpur, as Assistant in place of Mr. Ranganath Rao, who was permitted to return to the Mysore State. Mr. Deshpande promises to make a useful Research Assistant. Mr. Roy continued to work satisfactorily. Mr. Gregory was granted another extension which he has justified. Additional Assistants are required.

Botanical Field Laboratory.—A small "Rat-proof" Field Laboratory has been constructed near the College Farm. It will now dispense with the necessity of bringing in heaps of bundles of juars, wheats, rices, etc., in the Class-rooms of the Agricultural Research Institute and shall be very useful for the preliminary working of the crops there. The need for a stone threshing floor is, however, keenly felt. The threshing at present has to be done either on temporarily-made floors or on the verandahs thus causing much inconvenience.

Teaching.—The 1st and 2nd year students were given short courses in Botany, while those in the third year had a full course. Instruction in this subject was also imparted to the fourth-year class towards the end of the year.

The 2nd-year students had also a practical course in Horticulture, in which they took keen interest. As an encouragement to students, whose work was found satisfactory, they were allowed to utilise the plants which they themselves had propagated by budding, grafting, etc.

Rice.—Testing of rices from the districts has been continued. A number of Gurmatia rices were also under trial and Tumki Gurmatia promises to be a fairly heavy yielder. Selections have been made in the Basmatia and Nasik rices and two types possessing good straw and yield have been isolated and are now being tested at Adhartal on a field scale. Four heavy yielding late rices have been sent to Raipur to be tested at the Labhandi Farm. A number of fine rices are also being tested at Nagpur to find a variety combining quality with yield, the ideal aimed at being to get as heavy a yield as possible in a good quality rice.

An enquiry into the origin of awns in cultivated rices was undertaken and investigation made to determine the nature and character of the partial awns in an apparently awnless variety. Efforts were continued to find out if the presence of awns is a variation or the result of natural crossing. About 120 different varieties were sown in single line cultures and their awns, longest in the line have been measured and purity tested for any indication of a cross.

Seventeen new paddies have been received from Pennang Federated Malaya States in exchange for some rices supplied from here. These grains appear promising and are now under trial at Nagpur and the Labhandi Farm.

Wild Rices.—The systematic study of the wild rices has been continued. About 50 types have been isolated, and an attempt is being made to study the character and nature of the natural crosses obtained.

Juar.—Natural crossing produced extreme complexity in some of the varieties and rendered the classification of this crop difficult so that for the purpose of studying the unit characters and their behaviour with regards to the Mendalian proportions artificial crosses were made between the various types of juars. These crosses have been mainly intended for determining the characters of the grain and the glume and also for compactness and looseness of the cob.

From the F2 and F3 generations over fifteen thousand cobs were examined.

Wheat.—The special points to be aimed at are yield, stiffness of straw and rust-resistance. With these ends in view more crosses were made. The F2 generations of the former crosses were grown and tested for rust at Adhartal where rust occurs every year. It is to be noted that in Nagpur these crosses, though irrigated, remained perfectly immune to rust, but some of them were badly attacked at Adhartal and had to be rejected. In order to save time it was found useful to test the crosses for rust at Adhartal where the testing can be final. Those crosses which remained absolutely free from rust have been kept and will be tested again. These will, it is hoped, form valuable parents for further crossing. Some of the Australian crosses were also tested at Adhartal. Some of the crosses made last year appear to be very promising as regards straw, grain and yield. Some of the plants were six feet high and had long ears with plump grains. Marquis wheat from Canada is distinctly late and did not do well either in Nagpur or at Jubbulpore. Next year it will be tried again early. It tillers well and may prove to be a useful type for combining this character with others. The selections which were made from Australian crosses and local wheats were made over to the College Farm for trial on a large scale.

Cotton.—An early cotton with a high ginning percentage has been isolated for the higher portions of the Plateau Division where frost prevents the growing of ordinary varieties. Seed will be supplied to the Deputy Director of Agriculture, Northern Circle, for test on a field scale next year. Some pure strains have been selected out from Bishnoor which is a local variety of cotton and is said to be immune to wilt. Some types have also been grown at Akola in wilted area.

With a view to improve the quality of lint, selections have been made from an American cotton and sufficient seed has now been raised and handed over to Mr. Allan for trial on a field scale. Other cottons from the Punjab and United Provinces have been obtained and efforts are being directed towards the improvement of lint.

Linseed.—This crop was taken up in 1916 for investigating the question of certain mixture which was said to have crept in unaccountably in the linseed grown on the College Farm. These mixtures have since been ascertained to be due to natural crossing. With a view to unravel the unit character of the seed, a large number of crosses were artificially made in 1916 and the character of the hybrids and their behaviour with regard to the Mendalian proportions are being studied.

Potato.—The breeding of potatoes has been in progress, the object being to get varieties resistant to bacterial rot. For climatic considerations Chhindwara District Garden was selected for the growing of the crop. The Patna variety flowered profusely, but the setting of the seeds was not so regular. This was due to the fact that in nearly 50 per cent of the flowers the anthers did not burst and the flowers faded and dropped off. However, some healthy plums were obtained for seeds.

The tubers from each seedling potatoes were collected separately and stored. Several of them escaped the rot in summer and seem promising and will be grown next cold weather. In order to make more rapid progress in the work, it is arranged to grow a monsoon crop at Pachmarhi and the tubers from the same will be sown in September at Chhindwara.

As the other varieties did not flower, no crossing could be done this year.

Capsicum.—The demand for selected seed has been steadily rising. The Deputy Director, Southern Circle, informs that the early round variety (Capsicum annum var. cerassiformis) is much liked by the cultivators in Chhattisgarh and several acres are now grown at Akaltara in the Bilaspur District.

This variety is particularly suited for land which is not commanded by irrigation as it ripens on the rainfall received during the monsoon, and hence requires no irrigation.

Botanical Garden.—The Botanical Garden has now been well established. The total number of named and labelled plants in the Natural Orders is over 600. The plants which were brought from the old Botanical Garden or from outside stations have fully recouped now, and in addition to their educational value also impart a graceful appearance to the area around the Agricultural Research Institute.

Besides the students of the Agricultural College, other students of Botany from other Colleges also come to study the plants. The area at the west end of the garden, which used to get water-logged during the rains, has been underdrained with earthen pipes. The minor drains were laid north to south in parallel lines 20 feet apart. and were joined to a main drain running west to east. The depth of the drain at the outlet was one foot and at the commencement 2 feet 7 inches. The grass lawns of pure Dub (Cynodon dactylon) have been maintained.

Economic Garden.—The old Botanical Garden has been converted into a garden for economic plants. At present seven plots have been laid out in a spiral series so as to provide room for extension of plants in any group when necessary.

At present the following groups are represented :—(1) Fibres ; (2) Dyes and tans ; (3) Food products, chiefly underground tubers and roots ; (4) Oil plants ; (5) Medicinal plants ; (6) Rubbers ; (7) Condiments and spices.

The plants are necessarily filled in gradually, but it is hoped that the garden will form a useful nucleus for an enlarged garden later on.

Fruit Garden.

(1) *Oranges.*—The orange trees in the manurial series came to flower in February (Ambia Bar) and the fruits ripened in cold weather. The growth of the trees has already begun to show the effect of some of the manures. However, as the value of a tree depends not only on its luxuriant growth but on the quality and yield of its fruit, it has been found necessary to count and grade the fruits from each tree separately. The results will thus be watched for some more seasons and it will then be possible to arrive at definite results as to the nutritive and productive value of each kind of manure on these plants.

(2) *Banana and Plantain.*—The variety experiment has been continued. Some of the lines in the variety have been extended for further test. Eleven pure varieties have been introduced and are growing well. Of these, the following are in much demand locally :—(1) Butam, (2) Rajapuri, (3) Bombay green, (4) Elchi.

" The ridge and furrow system " with the trees on the ridges having proved best has been maintained throughout. The distance from ridge to ridge is 8 feet and the same distance is kept from plant to plant. The water was given once in ten days in the trenches between the rows.

It is observed that after two crops have been taken from a stool the yield from the ratoon of the 3rd year deteriorates in quality and quantity. This deterioration, I think, is due to the suckers sprouting up from the parent tree from the upper buds near the surface of the ground, with the result that the ratoons do not get sufficient nourishment. The defect is more distinctly visible in the gardens where plantation is done in shallow pits.

In order to avoid this, it is found advantageous at the end of every second year to plant a new sucker in a pit dug between the existing stools. After the original pits have had two years' rest suckers could again be planted in them and a rotation thus maintained. A pit, 2 cubic feet deep, has been found to be most suitable.

(3) *Velvet Beans.*—Chiefly with a view to keep down the growth of weeds in the Fruit Garden, a few types of velvet beans were under trial for the last two years. Black seeded variety has been found to be remarkably luxuriant in vegetative growth and serves doubly by keeping the weeds down and by enriching the soil, the crop being ploughed up after picking the beans. All the selected seed of this variety has now been handed over to the Principal, Agricultural College, for trial as fodder.

Mycology.—The work done in Mycology in the Central Provinces has been the collection of specimens and the breeding of rust-resistant wheats and wilt-free cottons. The specimens, if new, were sent to Pusa for identification.

The following specimens have been found to be of interest:—

(1) Sclerotium oryzæ—on Gurmatia rice collected from Raipur, Bilaspur and Chanda Districts.

(2) Wilt and Rhizoctonia—on Cicer arietinum.

(3) Rhizoctonia destruens—on Lens esculenta.

(4) Rhizoctonia destruens—on Triticum vulgare.

The collection is nearing completion, and it is hoped to publish a short list of "Diseases of Economic Plants" which will serve as a useful guide for further work.

With a view to get rust-resistant wheats several crosses were made and grown under irrigation in Nagpur, where they remained immune to rust, but some of them got the attack at Adhartal. Hence more crosses were made and tested at Adhartal where rust occurs every year.

A few ears of wheats which were kindly sent by Captain Graham, R.A.M.C., from Basra, were grown for pure line cultures. These wheats, although irrigated, did not get any rust in Nagpur, and next cold weather they will be further tested at Adhartal. These, if found rust-free, will form useful parents for crossing.

Some pure strains have been selected out from "Bishnoor," which is a local variety of cotton and is said to be immune to wilt.

In conjunction with the Officiating Agricultural Chemist, experiments are being conducted to find out a cheap fungicide for wilted soils.

Herbarium.—Regular collection of plants for the Herbarium continued as before, but as the vegetation of Nagpur and its suburbs has been nearly fully explored, new and interesting specimens are now found with difficulty.

Attempts have also been continued to collect specimens from other parts of the Province.

An interesting collection of plants from Mesopotamia has been identified and added to the Herbarium.

Other Work.—During the year, besides the distribution of selected varieties of rices, wheats, chillies, etc., seeds of vegetables, flowers, forest trees and garden plants were also supplied to various individuals and institutions. Different kinds of seeds have been sent to Egypt and Mesopotamia, and it is gratifying to learn from the Agricultural Adviser, Basra, that "the seeds are very much appreciated by all to whom they are distributed."

K. P. SHRIVASTAVA,
Officiating Economic Botanist.

Report of the Agricultural Chemist, Central Provinces and Berar, for the year ending 30th June 1918.

For the whole of the year under review, I continued to officiate as Agricultural Chemist due to the absence of the permanent Agricultural Chemist, Mr. F. J. Plymen, on military duty.

The staff and distribution of work remained the same as in last year. Mr. A. J. Desai, B. Sc. (Bombay), was confirmed as Assistant to the Agricultural Chemist. Messrs. Ram Narayan and A. J. Desai availed themselves of two months' privilege leave and three months' combined leave respectively. Mr. Ram Narayan was wholly responsible for teaching and in his spare time was assisting Mr. Desai and myself, who have been sharing all the routine and research work carried on in the Laboratory. Mr. D. V. Bal has been doing all the Bacteriological work, and a report of his work is attached.

All the Assistants co-operated with me and worked very well and willingly.

Tours.—I visited all the experimental farms excepting Hoshangabad and Sindewahi and some of the oil mills of the Provinces. The Assistants went to Katol, Ubali and other places to collect samples of soils from orange gardens. Monthly visits were made to Tharsa for sugarcane analysis. Altogether about 50 days were spent on tour.

During the past year the need of a small godown for storing oil and coal for gas-making purposes has been keenly felt, the supply of these materials being very irregular. Proposals for the erection of a small godown have been submitted to the Director.

The present war has made it almost impossible to get any regular supply of suitable scientific apparatus and chemicals, but work is being carried on under trying circumstances with the stock in hand supplemented by local supplies and occasional indents from England.

Education.—Students entered into the 3rd-year or Degree course for the first time under the new 4-year course and had to devote their attention this year mainly to the study of Science. A detailed syllabus was drawn up and Mr. Ram Narayan was entrusted with the teaching of Chemistry and Physics both theoretical and practical. That his instruction was good and efficient has been testified by the annual examination result. A report on the same was supplied to the Principal, Agricultural College, Nagpur.

General Analytical work.—This includes only the samples received for routine analysis and does not take into account the large number of analyses carried out under the heading of special investigations.

The samples analysed are classified below :—

Water	...	...	...	3
Manures	...	...	...	48
Feeding stuffs and cakes		...	...	26
Oil-seeds and oil	...	...	...	10
Soils	...	...	...	3
Miscellaneous	...	...	...	15
Dairy products	...	...	...	3
			Total ...	108

The number of samples received for analysis from the public, as distinguished from those from Government farms and departments, continues to increase. The analyses of various cakes, oil seeds and oils were done mainly for the oil mills in the Provinces.

It was decided at the departmental conference held on 24th November 1917 that of the various commercial products an analysis of only one sample of any one variety should ordinarily be carried out for any private firm by the Agricultural Chemist free of charge.

Mechanical, Chemical and Biological analyses of Dorsa soil of Chandkhuri Farm and Domatia soil of Jubbulpore were carried out and a chart, showing the differences in composition of the black soils of Tharsa and Chandkhuri Farms, was prepared and sent to the Deputy Director of Agriculture, Southern Circle.

A.—Dairy Products.

Special Investigations.—To complete the line of investigations already in progress in connection with the changes in the composition of milk and butter fat due to seasonal variations and changes in feeding, the following three lines of work were undertaken :—

(1) A study of the specific effect of the three common oil cakes, linseed, cotton and til (when fed to milch cattle) on the composition of milk and butter fat.
(2) To determine a cheap and good food mixture for milch cattle of the Provinces.
(3) A study of the optimum ratio of concentrated food to milk yield.

Definite schemes of experiments were drawn up in all the above cases.

The first line of investigation involved a complete analysis of 168 samples of milk and a detailed study into the composition of 168 samples of ghee.

It would be impossible in this report to give all the details which will be collected and published in the form of a bulletin, but of the many points observed the few interesting ones may be mentioned. Feeding with til cake brought about a slight reduction in the amount of fat whereas linseed and cotton cakes either maintained or increased the amount of fat. It was also noticed that butter fat produced from milk of buffaloes fed with cotton seed cake gave distinct reactions of cotton seed oil, thereby showing that cotton cake feeding modifies the character of fat.

2. Different rations having the same number of food units and having approximately the same money value have been tried on three groups of buffaloes at Telinkheri Dairy and the yield of milk and amount of fat have been ascertained and noted. This experiment had to be discontinued during the summer months when the animals began to dry up and will have to be continued for some months before a definite ration can be safely recommended.

3. Different amounts of concentrated food ranging from 50 to 70 per cent to the milk yield have been tried on both cows and buffaloes at the College Dairy. In this connection about 800 samples of milk have already been analysed and the experiment is still in progress. The figures obtained so far tend to show that concentrated food equal to 60 per cent to the milk yield will probably prove to be optimum quantity.

B.—Sugarcane.

In connection with the series of experiments carried out at Tharsa Farm for the past five years to determine the effect of the time of planting on the period of maturing of the cane, monthly analyses of juices of *Sannabille* cane were carried out. The results of the last five years have shown conclusively that this variety comes to maturity in February whatever may be the date of planting, *i. e.*, cane planted in October, November, December, January, February and March contains a maximum quantity of sucrose when cut in February, but the cane planted at the end of December or in the beginning of January has generally given the largest yield of *gur* per acre when crushed and boiled in February.

At Adhartal about 50 analyses of cane juices were made. Some varieties which were not promising had to be rejected. The effect of different manures upon Pounda, Khari and red Mauritius canes was studied. The analytical figures will be found in the respective farm reports.

C.—Pot Culture Experiments.

Series of pot culture experiments on the growth of sann hemp on Bhatta soil (a lateritic soil found abundantly in Chhattisgarh district) subjected to different treatments of manuring were carried out. It was noticed that time had no beneficial effect at all but super and basic slag stimulated the crop. The experiment is being continued.

D.—Citrus Soil.

Nagpur and suburbs being famous for oranges, a study of the soils of orange gardens was taken up. Samples of soils from typical orange gardens were collected and analyses of the same have been started. This work was undertaken on the hope that it might throw some light on the soil conditions necessary for porduction of a good orange crop.

E.—Juars.

Different varieties of juars grown in the Central Provinces and Berar were analysed with a view to find out differences, if any, in their food value. The work has just been completed and results will soon be published.

F.—Miscellaneous.

One material received for analysis which might be used as a feeding stuff was a sample of Mahua refuse from Kanhan Distillery. From the analysis, it seems to compare well with other feeding stuffs, but its physiological effect on cattle is being tested at the College and Telinkheri Dairies.

Analyses of drainage water from manured and unmanured plots on the College Experimental Farm have been started in order to determine the nature and extent of the losses which drainage entails.

Experiments on Sewage Purification.—This line of work was undertaken in collaboration with the Principal, Agricultural College, Nagpur, to find out how far sewage, when applied to black cotton soil, is modified and absorbed by the latter. Samples of sewage and drainage water were analysed from different plots, both cropped and fallow, receiving sewage irrigations weekly or fortnightly.

It was observed that the composition of the sewage water as might be expected was not uniform and even the samples taken at different times on the same day showed considerable variations. Estimation of nitrate and total nitrogen showed that of the total nitrogen supplied to the soil (in weekly and fortnightly oat plots) in the form of sewage about 33 per cent appeared in the drainage water in soluble form ; whereas in fallow plots about 43 to 49 per cent of the total nitrogen was found in the drainage water. The smaller amount of soluble nitrogen in the drainage water from the cropped plots must be due to a large proportion of nitrate nitrogen being used up by the crop. It follows therefore that to use fallow land for the purification of sewage is a waste, as a very large amount of nitrogen passing uselessly in the drainage water can be profitably utilized for crops.

Judged by the standards given by various authors for the purified sewage effluents, it is seen that the drainage water obtained in these experiments has attained a sufficient degree of purity.

BACTERIOLOGICAL SECTION.

I.—Biological Analysis of Soils.

A.—Embanked Wheat Soils of the Jubbulpore Tract.—This work was undertaken with a view to finding out if the gradual deterioration of wheat yields in these soils was due to lack of any of the normal biological activities resulting from the continued practice of embanking which has been in existence in this tract for years.

Samples from the experimental plots of Kheri wheat farm were taken in the month of October 1917. These experimental plots received the following cultivation. Plot No. I was kept open and was ploughed at the beginning of the rains and harrowed at intervals during the breaks of the rains. Plot VI was kept flooded with water until one month before sowing, when it was drained and one harrowing was given before sowing. Plot VII was kept flooded and no cultivation given, but the seed was sown as soon as the land was dry enough. The following conclusions can be drawn regarding these soils from this year's results.

The moisture content of the samples of soil taken in October showed that Plot VII had 32 per cent, Plot VI 31 per cent and Plot I 26 per cent as against 44, 40 and 35 per cent, respectively, last year. A low percentage of moisture was evidently due to absence of late rains this year. There were many hard clods in Plot I and the tilth of this plot in general was bad. This was most probably due to the fact that the last cultivations were not done under suitable conditions regarding moisture and when once the texture was spoiled there was no further rainfall to restore the same. The effect of this bad seed bed has told on the outturn of wheat and also on the nitrifying activity of the soil bacteria quite contrary to our previous year's experience. Plots VI and VII were, however, in a good condition. It will thus be seen that Plot I had two distinct disadvantages this year, one a lower moisture content at sowing time than the other plots and the other a bad seed bed.

This year's results of analysis show the following :—

(1) The nitrogen fixing power of all the plots was more or less agreeing with the results of the last year, and no noticeable difference in any of these plots was observed.

(2) Soil oxidation (as determined by the rate of Co_2 production after addition of organic matter as cake) in samples from Plot I and VI was practically on the same level, but Plot VII showed a little superiority over the others, and this may have been due to the fact that it had the advantage of a higher moisture content than the others.

(3) The number of bacteria in Plot I (as found on plating on ordinary agar) was however much lower than Plot VI but was still higher than Plot VII.

(4) The results of nitrification in the case of Plot I were contrary to those obtained last year. The percentages of nitrogen transformed in the form of nitrate from the same amount of organic manure (*i. e.*, til cake supplying 60 mgm. nitrogen per 100 grams of soil) after eight weeks' incubation, were as follows :—

Plot I	...	21·3 per cent
,, VI	...	53·4 ,,
,, VII	...	46·9 ,,

The outturn of wheat from the three plots was as follows during this year, 1917-18:—

Outturn per acre.

	Grain in lbs.	Straw in lbs.
Plot I	... 589	... 570
,, VI	... 615	... 729
,, VII	... 534	... 576

The relation between the nitrifying power and the outturn of wheat from Plot I is rather interesting. The superiority of Plots VI and I over Plot VII, however, still shows the good effect of rainy weather cultivation to these Kheri soils, provided it is done in a proper time. These experiments will be repeated this year.

B.—Bhata Soil.—Bhata soils have of late attained a very great importance in the Chhattisgarh Division of this Province and they were lying as waste lands, uncared for, up till now. A biological analysis was done with a view to finding out how far this soil was deficient in the usual biological agents and wether it could be easily brought under cultivation. Figures of analysis show that this soil is quite efficient in the production of carbon dioxide and also in ammonification. The rate of nitrogen fixation is, however, about half of what takes place in black cotton soil. The latter fixes about 9·3 mgms. nitrogen per gram of mannite as against 4·6 mgms. by the former.

Nitrification, though not as good as the black cotton soil, can still safely be classed as average. Fine soil (excluding stones and gravel above 1 mm. which amount to about 69 per cent of the whole soil) was found to nitrify about 60 per cent of the added nitrogen in the form of til cake, whereas original soil direct from the field (including stones and gravel) nitrified only 32 per cent of the added nitrogen. The average nitrifying capacity of black cotton soil however is about 65 to 70 per cent.

Various leguminous crops like Tuar (Cajanus indicus), Cowpea (Vigna catiang), Sann hemp (Crotalaria juncea), Dhenchya (Sesbania aculeata var canabina), Velvet bean (Mucuna utilis) and ground nut (Archis hypogoea) were grown in bhatta soil and black cotton soil side by side without any artificial treatment. It was found that growth of plants in Bhatta soil was very much inferior to those from black cotton soil ; and that the former had a very poor development of root nodules. This effect was not, however, so much noticed in the case of groundnut crop. Subsequent pot culture experiments on sann hemp alone have conclusively shown that inoculation of the bhatta soil with black cotton soil shows much improvement in the growth of the plants and that inoculation combined with a dressing of til cake at the rate of 10 maunds per acre at sowing time gives most promising results.

Bhata soil appears to respond very readily to organic manures. It is also expected that by continuous application of organic manures and irrigation the nitrifying power of the soil will be improved.

Dorsa soil.—Analytical figures did not show any special points of interest so far and hence no details need be given.

Domatia soil.—This soil is of a light sandy nature from Jubbulpore tract ; its saturation capacity being about·32 to 33 per cent. The average nitrifying power of this soil is quite good. No special characteristic features have been noticed.

II.—Determination of the relative availability of the various Organic Manures commonly used in the Central Provinces.

As indicated in last year's report a part of this experiment dealing with the black cotton soil is completed and will shortly be published. Further experiments in this series were continued with Dorsa, Domatia and Bhatta soils during this year. It was observed that of the various cakes tried on different soils, Mahua cake was not nitrified at all in any of the soils. An extract of Mahua cake even exerted a deleterious effect on the nitrification of til cake in black cotton soil.

III.—Experiments relating to the Changes in the Biological Conditions of Black Cotton Soil due to Seasonal Variation.

The plots selected for this experiment were :—

(i) Kharif plot receiving cultivation throughout the year and sown with juar in the rainy season

(ii) Rabi plot left fallow with frequent cultivations during rains and sown with wheat during the cold weather.

(iii) An uncultivated plot which has been left fallow for years.

Samples from the above three plots were taken thrice in a month and determinations made of moisture content, nitrogen fixation and nitrifying power.

It was observed that there was no characteristic difference between the nitrogen fixing power of the various samples. The average nitrogen fixation was from 9 to 11 mgms. of nitrogen per gram of mannite.

Nitrifying power was at its maximum during July, August, September and October. A very marked relationship between moisture content and nitrification was observed. As the moisture content increased, nitrification increased simultaneously. On one or two occasions of heavy rainfall when the moisture content of the soil had gone as high as 44 per cent, reduction in nitrifying power was observed. Nitrification in the fallow plot was throughout rather poor and that in the rabi plot, though better than fallow plot in many cases, was remarkably inferior to that of kharif plot. Various other interesting points also were noticed which will be dealt with fully in the full account of the work.

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Department of Agriculture, Central Provinces and Berar.

REPORT

ON THE

1. AGRICULTURAL COLLEGE, NAGPUR,
2. BOTANICAL AND CHEMICAL RESEARCH,
3. MAHARAJ BAGH MENAGERIE,

FOR THE

Year ending the 30th June 1919

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YEAR 1918-19.

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The College Report, 1918-19.

WORK DURING THE YEAR.

The general lines of the syllabus of the last year were maintained during the year under report. A more systematic effort to improve the English of the College was made in the introduction of a course of this, at first for 2 hours a week and later for 3 hours a week. This was given by a professor of the Morris College. After alterations in the nature of the matter taught as the result of this year's experience, I am of the opinion that the teaching of this subject will prove of considerable benefit to the students of the first year. Some alterations were made in the second year course, and by a slight reduction in the time devoted to field work, it was found possible to introduce a third section in the syllabus, covering courses in Physics, Elementary, Botany and Physiology and Anatomy. This strengthened the botanical teaching by leaving less to the third year and will prove of value to the Agricultural School teachers under training for two years. The removal of Physics to the second year allows more time for Agriculture in the final years, the need of which was obvious from the results shown in the fourth year final examination, wherein it was evident that students had not attempted to keep up their Agriculture as they should have. The inclusion of a fuller course of two hours per week in the second year in Physiology and Anatomy has allowed this subject to be taught more fully and should improve the capacity of students to understand their Veterinary Science in the third year, while the knowledge acquired will be of value to such second year course men who fail to reach a standard, permitting of promotion to the senior course.

The first final or degree examination under the new course was held in December 1918. The students appearing for the examination were generally rather above the average level of general intelligence and capacity than in most passed finals. The results were not quite as good as were hoped for. The Science subjects were very fair, but in Agriculture while questions relating to subjects of more advanced type, done during the passed two years, were respectibly done, more elementry questions were not well dealt with, indicating that under the pressure of science subjects students had failed to give attention to the revision and improvement by reading of the material taught in the first two years. It must, however, be noted that the epidemic of influenza in September and October seriously upset studies.

It is hoped that the greater attention since given to essays, and the longer time devoted to agricultural discussions, will cause an improvement.

AGRICULTURE.

The first year work was on the lines of that of passed years. No marked alteration was made except that Anatomy and Physiology lessons in the latter part of Section I were given up and more time devoted to Agriculture. The laboratory work was improved by the addition of more apparatus to study soil characters.

The year contained six masters. As usual, the students showed considerable variation in capacity, but on the whole they were fairly well up to the standard in work and ability.

The second year carried on their farm, garden and stock work. Their work was good. The season was most favourable and their farm gave them a very good profit on the year's work. The time devoted to practical agriculture was reduced by four hours. As a whole the class was above the average in keenness and capacity. The third year worked on the lines of that of 1917-18, being engaged in lectures on manures, irrigation and farm economics and in two hours weekly discussions of subjects taken more briefly in the early course. Their practical entailed the management of farm plots of experimental character and a day's employment per week as farm managers. The general showing of the year was only fair.

The fourth year were given lectures in the relation of the landlord to the tenant, land laws, co-operation and co-operative credit and Indian agricultural production and trade. Discussions on special subjects were continued. Each student was given a simple piece of original research. The year had all the indications of being above the average, but, as noted earlier, neglect of private study and revision of elementary subjects told against their results in the final.

BOTANY.

This subject was taken in elementary form about four hours per week in the second year. The course was largely Morphology, but covered an elementary outline of Physiology and internal plant structure, so as to make it complete for those who would not go further. The main botanical work was restricted to the third and fourth years. The general showing of the fourth year showed that on the whole they had grasped the subject and that its teaching had been satisfactory. The work was conducted by Mr. Kalka Prasad, assisted by Mr. Roy.

CHEMISTRY.

The work in this subject was restricted to the third and fourth years. The examination of the fourth year showed that the work had been satisfactory. On the examiner's suggestion, certain changes have been effected in the course, and general chemistry will be examined and passed at the end of the third year instead of carrying forward.

VETERINARY SCIENCE.

There is nothing to report; the course was as that of 1917-18 and under the same lecturers. The students of the third year showed up on the average as possessing a better knowledge than has been evident in other years.

ENGINEERING, MATHEMATICS AND SURVEY.

Class work was as in 1917-18. More time was, however, devoted to Mechanics in the second year. This section, together with Physics, should be under a special teacher. At present it is divided up among several assistants, none of whom are as fully qualified for the work as they might be. This does not imply that the teaching has been inefficient, but that the time so spent by these men might be better employed in their own special lines of work. I propose to take steps this year to secure for 1920-21 a man qualified to deal with Farm Arithmetic, Mechanics and Simple Theoretical Engineering, Survey and Physics, containing the special courses in building and machines.

PHYSICS.

A course in this subject was introduced into the second year syllabus, and given three hours per week and replaced the somewhat unsatisfactory attempt to deal with the subject in the third year. The course was given by Mr. Ram Narain. There was a considerable increase in the amount of physical apparatus available, which assisted in improving the efficiency of the teaching.

ENTOMOLOGY.

The subject was resumed with the new fourth year and replaced Veterinary Science taken in the third year. Nine hours a week were given to the subject and the more continuous study appeared to increase the interest shown and improve the results arrived at.

GENERAL.

Experience gained during the passed two or three years is gradually tending to crystalize the course, though it may be open to slight alterations as time passes.

The first year examination and results of the work in that year are now being made to give a preliminary selection of those with a possible chance of being placed in the first division at the end of the second year, and those who may get a pass and are allowed to proceed from the first to the second year. The passes from the first year are given in two classes. Class I in the second year take a course consisting of three sections, *viz.*, (1) Agriculture, Animal Husbandry and Horticulture and Farm Management; (2) Survey, Mechanics, Accounts and Simple Engineering; (3) Physics, Botany and Anatomy and Physiology. Class II takes groups one and two, but will replace group three by courses in Carpentry and Blacksmithy whenever the necessary building fittings and demonstrator can be provided. Due to lack of budget provision, it is probable that this will not be in full swing before 1920.

The first year course is in general as it was, though more time is now given in English and Mathematics, and apparatus and room are gradually extending, permitting the more accurate practical study of soil phenomena and characteristics under laboratory conditions. This will again reach greater perfection when the Entomologist is able to move into his new laboratories and allow the conversion of the rooms he now holds into an efficient agricultural laboratory. The advanced course should now be better as the study of elementary Botany in the second year relieves the pressure in the final and allows more complete study, and the removal of Physics from the third year improves the chances of agriculture.

The general indication is that to strengthen the degree course, it will be necessary eventually to separate the diploma men more markedly than at present, relieving the final of some more elementary science, for instance, in Chemistry, and thus giving more scope for agriculture. It may be possible thereby to complete a general all-round standard by the end of the third year, and reserve the fourth year for specialization in agriculture (possibly one branch of this) and a single science.

Conduct and Discipline.

Both have been on the whole satisfactory. There was some tendency to lateness and slackness in attending practical classes on the part of some first year students, but this was dealt with. Bad offenders were dismissed at the end of the year and all did extra time on the farm on holidays.

Tours.

The tour to Akola was given up on account of influenza and famine. That to Adhartal, due for performance in October, was combined with the tour to Hoshangabad in March.

College buildings.

A start has been made at the dairy to extend the accommodation for teaching by the construction of a dairy teaching laboratory. This will be in use by November.

Apparatus for this is on order and is expected by that date.

The rooms now held by the Entomologist have been thrown into one by the formation of an arch. On his evacuation of this for a special laboratory under construction the room will be utilized for agricultural laboratory experiments and as a survey and engineering room.

A new laboratory to take research and teaching is under construction on the farm.

The College Hall has been provided with pictures, chiefly enlargements made by the College Artist.

Some slight alterations are being made in the latrine arrangements of the hostel, otherwise the building is unchanged. Further levelling has been done on the College sports ground and it is hoped that with care and rolling a better

hockey ground will result. The area, however, requires draining and a succession of applications of sand to make it a first class area.

A blacksmithy and carpenter's shed has been built on the farm for second year students. It is expected to be in use during 1919-20.

Students. The entry into the first year was not quite as good as that in the passed years, and the number examined at the end of the year was below the average.

38 students were placed on the roll by the end of July, but only 31 appeared in the examination. This falling off was due to influenza, which caused the death of one student, the loss of mental balance of another, and the physical incapacity of the rest preventing them resuming.

Of the 38 above mentioned, eight were teachers under training for the Agricultural Schools, two on a one-year course, and the remainder on a full two-years course. Ten students were admitted on the College entrance examination, of these one left and four were not re-accepted into the second year, as they failed in the first year examination and showed little capacity. Of the teachers, sent for two years, three appeared to be fair, two medium and one was a failure.

The numbers in each year at examination are given below :—

Year.	On roll.	In examination.
1st year	38	31
2nd year	24	23
3rd year	8	8
4th year	10	10
Total ...	80	72

The following is the analysis showing area from which recruited of those who appeared for examination : —

Year.	North Central Provinces.	South and East Central Provinces.	Nagpur and Wardha.	Berar.	Central India.	Other places.	Total.
1st year ...	15	10	...	2	3	1	31
and year ...	15	2	...	...	6	...	23
3rd year ...	4	...	...	...	3	1	8
4th year ...	4	2	2	...	1	1	10
Total ...	38	14	2	2	13	3	72

The percentage from the Central Provinces and Berar is 77½ per cent. This is largely due to a larger number than usual in the second year. Normally the admittance to the first year course works out at about 88 per cent from the Central Provinces and the balance from Central Indian States.

HEALTH.

Except for the influenza epidemic, the general health was good. There were about 10 to 12 cases in the hostel, but none were serious. The break up

of the College was caused more by deficiency of staff due to sickness and on medical advice than from any great need as far as the students were concerned. Indeed in many cases they would have been better off and less liable to bad effects if they had stayed under proper sanitary and medical control.

The 4th year and several students remained in residence all the time, and of these only one developed a slight attack. Of those that went home, seven never returned.

The College remained closed from 5th October to 6th November after the Divali break, a period of 4 weeks. The time was compensated for by restriction of the Divali holidays, the giving up of the Christmas holidays, by work on Saturday afternoons or Sundays and a slight extension of the teaching period in March. The break, however, had a bad effect on work and interfered with rabi sowings and field practice at an important season of the year.

EXAMINATIONS.

The final of L. Ag. Course was held in December. The other examinations including the Diploma in March.

The Examiners in the Final were :—

Agriculture	...	Mr. R. C. Wood, Principal, Coimbatore College. The practical and *viva voce* being done by the Director and Principal.
Botany	...	Mr. D. Milne, Economic Botanist, Punjab.
Chemistry	...	Mr. W. H. Harrison, Imperial Agricultural Chemist.
Entomology	...	Mr. T. Bainbrigge Fletcher, Imperial Entomologist.

In the Diploma :—

Section I—Agriculture	...	Mr. J. B. Knight (Poona) along with the Principal.
Veterinary	..	Mr. C. W. Wilson (Central Provinces Civil Veterinary Department) both in 3rd year and in Diploma.
Physics	...	Mr. Ayer, Agricultural Chemist.
Botany	...	Mr. Kalka Prasad, Economic Botanist.
Engineering, Mathematics and Survey	...	Mr. E. Cove (School of Handicrafts), Mr. Rackstraw (Engineering School), and Messrs. Phatak and Khare (Agricultural College).

In the 1st and 3rd years the examinations were conducted by the local staff.

Fourth year—Final L. Ag.

Total examined.	First Class.	Second Class.	Failures.
10	2	5	3

The results shown in Chemistry, Botany and Entomology were very fair. In the former agricultural chemistry was better than general chemistry. The examiner indicates that this arose from the fact that, as done in the 3rd year,

it was partly neglected in the 4th year under pressure of other work, and suggested that this should be dealt with in the 3rd year. Botany results might have been better, but this year suffered by reason of rather great pressure of work in this subject, now relieved by the introduction of elementry botany in the 2nd year. Agriculture was not what it should have been. There had evidently been a good deal of neglect of revision work. Subjects dealt with in particular in final years were fairly well done. More elementry subjects were not well done. The external examiner failed 3 and placed 2 on a doubtful list.

Their work as shown by original research problems and local examination was, however, sufficiently good to allow of a pass. The essay was not well done, and more practice on this is now being given in this class of work. Taken all over in general capacity, intelligence and interest, the year promised much better than examination results showed, and I am of the opinion that influenza and its upseting effect on those attacked and on the College work as a whole immediately prior to their examinations was largely responsible for the poor visible results. One man failed in Chemistry, 2 in Botany and 3 in Agriculture.

First year—Pass Examination.

Appeared.	First Class.	Second Class.	Failures.
31	17	8	6

The general agricultural knowledge both on paper and on field was on the whole very satisfactory. As usual, a number were weak in Mathematics, and the English, as shown in the paper set, left a good deal to be desired in several cases. The first nine on the list were above the rest in general standard. Of these 5 were ordinary students and 4 masters under training. The 7 who failed included all the known slackers during the year.

Second year—Diploma.

Appeared.	1st Division.	2nd Division.	Failed.
23	9	12	2

The work of the year as shown in examination was above the average throughout. The men who passed in the 1st Division did well in all sections; the percentage of failures was distinctly smaller than usual. The two who failed were weak throughout.

Third year Pass Examination.

No. of students.	1st Division.	2nd Division.	Failed.
8	2	4	2

Fair results only. The class is not a particularly good one. Of the two men who failed, one did so for the second time in Chemistry and the other on account of sheer slackness. Veterinary was on the whole quite good. Chemistry and Botany fair to middling; Agriculture fair. With the exception of a good

paper by the first student in Botany and of the second in Chemistry, there were no outstanding cases of merit.

PRIZE WINNERS, 1918-19.

Fourth year.		
Director's Prize	...	N. Ramayah.
The Smythie's Chemical Medal	...	N. Ramayah.
Botany Special	...	Ravi Shanker.
Entomological Special	...	Sheo Narayan Derashri.
Agricultural Special	...	N. Ramayah.
Third year.		
Veterinary Special	...	Not given.
Second year.		
Class Prize	...	Dhanna Lal.
Section I (primarily Agriculture)	...	Dhanna Lal.
Section II (primrily Engineering)	...	Not given.
Section III (primarily Science)	...	A. N. K. Biswas.
Practical Agricultural Special	...	Shyamlal Tiwari.
Kedarnath Rai Medal	...	Mangilal Agarwal.
First year.		
Class prize	...	M. R. Beg.
Section I (primarily Agriculture)	...	Nilkanth Prasad.
Section II (primarily Mathematics and Survey).		Bhagwat Prasad.
Practical Agricultural Special	...	Dwarka Prasad.
College Prizes.		
The Coronation Medal	...	D. L. Janoria.
The Napier Essay Prize	...	R. R. Sarvate.

THE HOSTEL.

Mr. K. P. Shrivastava was in charge throughut the year.

Buildings. There were no alterations of great note. The new quadrangle was in full use and most popular. The latrine extension is in progress. A grain store has yet to be built.

Health. This has been mentioned in the general body of the report. It was on the whole good, and bar influenza, caused no anxiety. In the epidemic cases were promptly and efficiently dealt with by the Superintendent and the Hostel Doctor and no serious complications occurred.

The Agricultural Society. The Society had a very good year. Many papers were read, and discussion was more plentiful. The attendance was very fair and interest maintained.

College games and social life. There was very fair activity in foot-ball and hockey. Cricket was not as good as it has been. The Hockey team was above the average, but found that opposing college teams' standards had also risen.

The hockey competition was in the nature of a league. Tennis was not so well supported, probably because students found that the general cost of living necessitated some restrictions. The position in the Inter-Collegiate sports was a fraction better than in 1917-18, but we have still to unearth some born athletics. Results were not, however, the effect of lack of practice. The College suffers slightly in the sports as it loses its senior year before the sports occur.

The College day. This was held at the end of December. The attendance of old boys was very low. A certain amount of curtailment of programme had to be made on account of cost. The chief item left out was the usual dramatic performance.

Mr. King (Commissioner, Nagpur) kindly presided at the Speech Day and gave away the Degrees and Prizes won in College work and field sports.

R. G. ALLAN,

Principal,

Agricultural College, Nagpur

Results of Annual Examination, 1919.

No.	Names.	Total.	Division.
	4th Year.		
1	N. R. Ramayah	863	I
2	Sheo Narayan Derashri	831	I
3	Ravi Shanker	777	II
4	R. G. Chourey	775	II
5	Ram Sanahi	714	II
6	B. S. Katey	704	II
7	Kundanlal	697	II
8	D. N. Andharey	650	Failure.
9	K. K. Pilley	630	,,
10	Anand Dhar	600	,,
	3rd Year.		
1	Damroolal Janoria	564	I
2	Sheo Dayal Tiwari	525	I
3	N. D. Vyas	492	II
4	K. P. Sohaney	482	II
5	Kirpal Singh	481	II
6	Rajaram Vyas	475	II
7	P. D. Nair	419	Failure.
8	N. L. Verma	418	,,
	2nd Year.		
1	Dhanna Lal	642	I
2	A. N. K. Biswas	629	I
3	Ram Narain Dubey	625	I
4	Mangilal Agarwal	618	I
5	G. R. Gokhley	612	I
6	Shyamlal Tiwari	606	I
7	Bhola Prasad Nema	591	I
8	Balkrishna Dave	580	I
9	Shrikant Mishra	567	I
10	Shadilal Shrivastava	548	II
11	Y. N. Parnerker	536	II
12	Motilal Vaishya	519	II
13	G. M. Borgaonker	517	II

Results of Annual Examination, 1919.—(Contd.)

No.	Names.	Total.	Division.
	2nd Year.—(Concld.)		
14	N. P. Shendey	489	II
15	S. G. Joshi	485	II
16	C. V. Pant Vaidya	484	II
17	A. B. Moghey	482	II
18	R. N. Richaṛai	471	II
19	K. N. Kaley	469	II
20	S. M. Deo	458	II
21	Dhaṇsingh Gour	450	II
22	Damrilal Choudhari	370	Failure.
23	Umrao Prasad Singhai	418	,,
	1st Year.		
1	Nilkanth Prasad	442	I
2	M. R. Beg	425	I
3	Har Prasad Jyotishi	408	I
4	D. Y. Bhand	397	I
5	Surju Prasad Khare	396	I
6	B. R. Bhadkamker	392	I
7	Jugul Kishore Shrivastava	386	I
8	H. R. Bhawalker	385	I
9	Dwarka Prasad	382	I
10	Bhagwat Prasad Gomasta	368	I
11	G. K. Bhatwadekar	366	I
12	B. G. Joglekar	354	I
13	K. G. Paturker	354	I
14	S. K. Athley	349	I
15	Y. Yenkaiya	346	I
16	Uma Shanker	345	I
17	Ganesh Ram Sharma	344	I
18	R. R. Sarvate	336	II
19	Saligram Mali	336	II
20	Priya Das Naik	334	II
21	Adharsingh	331	II
22	Sukhlal Prasad	325	II
23	G. V. Bakrey	322	II
24	W. M. Gokhley	308	II

Results of Annual Examination, 1919.—(Concld.)

No.	Names.	Total.	Division.
	1st Year.—(Concld.)		
25	K. P. Tandaley	302	II
26	H. S. Bisen	298	Failure.
27	Kashiram Tiwari	222	,,
28	M. L. Verma	241	,,
29	K. R. Sumanwar	234	,,
30	A. C. Guha	298	,,
31	R. P. Kataria	288	,,

R. G. ALLAN,

Principal,

Agricultural College, Nagpur.

Statement showing the particulars of English Classes.

Classes.	No. on the Roll.	Average daily attendance.	Average on the Roll.	Classification according to creed and race.						Classification according to caste.			District from which recruited.						Age of pupils.			Parent's occupation.						
				Mohamadans.	Hindus.		Northern Hindus.	Others.	Total.	Brahmins.	Others.	Total.	Bengal or U. P.	Berar.	Central Provinces.	Native States.	Rest of India.	Total.	Maximum.	Minimum.	Average.	Government service.	Private service.	Profession.	Trade.	Agriculture.	Miscellaneous.	Total.
					Bengali.	Maratha.																						
4th year ...	10	9·1	9·5	...	...	2	8	...	10	5	5	10	...	...	8	2	...	10	29	21	23	4	...	...	...	6	...	10
3rd ,, ...	8	7·6	8·2	...	...	...	8	...	8	3	5	8	...	...	4	3	1	8	25	22	23	2	3	...	...	3	...	8
2nd ,, ...	23	21·9	24·4	...	...	7	15	1	23	13	10	23	...	...	17	6	...	23	25	19	21·6	3	7	...	1	12	...	23
1st ,, ..	31	29·5	35·0	1	1	12	17	...	31	14	17	31	1	1	26	3	...	31	18	30	22·8	12	4	...	...	14	1	31
Total ...	72	68·1	77·1	1	1	21	48	1	72	35	37	72	1	1	55	14	1	72	24	23	22·6	21	14	...	1	35	1	72

R. G. ALLAN,
Principal,
Agricultural College, Nagpur.

STATEMENT H.—Financial Statement of the Agricultural College, Nagpur, for 1918-19, *from 1st July* 1918 *to 30th June* 1919.

Heads of Expenditure.		Rs.	a.	p.
1.	Cost of College Establishment	(*a*) 24,099	2	5
2.	Cost of Hostel Establishment and Contingent Charges.	(*b*) 2,492	6	3
3.	Purchase of Furniture	3,769	8	0
4.	Petty Construction and Repairs	2,836	5	6
5.	Games Money	250	0	0
6.	Books for the Hostel Library	150	0	0
7.	Municipal Taxes, Fans and Lights	1,973	11	5
8.	Expenses of Students for visiting farms ...	671	6	6
9.	Examination Charges	1,150	0	0
10.	Scholarships	3,344	9	5
11.	Other Charges	1,583	8	7
	Total ...	42,320	10	1

Heads of Expenditure.			Rs.	a.	p.
(*a*) (1)	4/5th Pay of Principal, Agricultural College ...		9,600	0	0
(2)	His Local Allowance		1,200	0	0
(3)	Pay of Masters		11,079	6	1
(4)	Pay of Clerks		1,009	11	10
(5)	Travelling Allowance of Principal and his Establishment.		550	0	6
(6)	Pay of Peons		660	0	0
		Total ...	24,099	2	5
(*b*) (1)	Allowance to Hostel Superintendent ...		600	0	0
(2)	Pay of Hostel Chaukidars, etc.		438	0	0
(3)	Do. Cooks, etc.		1,086	0	0
(4)	Contingent Charges		368	6	3
		Total ...	2,492	6	3

R. G. ALLAN,
Principal,
Agricultural College, Nagpur.

Annual Report of the Economic Botanist, Central Provinces, for the year 1918-19.

Staff.—On account of the absence of Dr. Graham on military duty in Mesopotamia I continued to officiate as Economic Botanist throughout the year.

The number of Assistants in this Section remained insufficient, and towards the end of the year Mr. Gregory, Overseer of the Garden, retired from service. Special efforts had therefore to be made to manage the growing volume of work with the staff such as was available. Messrs. Roy, Gregory and Deshpande worked hard and rendered willing assistance in carrying on the Research and College work.

Botanical area.—The area under the Botanical Section is now about 20 acres. This includes the land under the orange experimental plots and the Botanical Garden around the Agricultural Research Institute. A large portion of this newly allotted area on the Farm has now been fenced to prevent inroads of cattle. It would be better if the remaining area be fenced with Page's woven fence in order to ensure protection against small animals including the troublesome pig.

Tours.—I spent about 40 days on tour outside Nagpur. In connection with my work on wheats and cottons I visited the Farms at Jubbulpore, Chandkhuri and Raipur and I also attended the second Mycological Conference at Pusa. The Assistants went out for a few days in connection with their work to Bhandara and Chhindwara. None could, however, attend any of the Divisional Agricultural Exhibitions.

Education.—The new course in Botany extends over a period of $3\frac{1}{2}$ years. The students of the first two classes were taught elementary Botany dealing with the general life history of plants and were given a thorough grounding in Morphology. These students also performed simple experiments demonstrating plant functions.

The advance course in Botany including Plant diseases was taught to the 3rd and 4th year students. The Economic Botanist, Punjab, examined the 4th year students for the Final Examination; and with the exception of one all the students were successful.

I took the 1st, 2nd and 4th year classes and Mr. Roy, who was entrusted with the 3rd year, acquitted himself well, seeing that this was his first time to teach a class. Mr. Gregory took practical classes in Horticulture.

Rice.—The work on rices has been continued. Two distinct problems are involved in improving rice. For the ordinary cultivator, yield is the important thing, while for the more advanced cultivators and for those who have facilities for irrigation, quality may make up for what is lost in yield in better rices. The ideal thus aimed at is one rice which combines the two characters. With these ends in view more rices were isolated and tested and handed over to the Deputy Directors of Agriculture, Northern and Southern Circles for trial on a field scale.

Of these Nos. 57, 60, and 107 have given good results. It is gratifying to learn that No. 107 stood first of all the rices grown at Jubbulpore. It gave an outturn of 3,325 lbs. per acre. No. 57 is a fine scented medium-ripening variety and is in great demand in the Northern Circle. No. 60 is also a fine medium-ripening variety and a heavy yielder with an outturn of 2,400 lbs. per acre. Our Nos. 57 and 60 therefore appear to combine quality with yield and thus nearly approach the ideal aimed at.

An enquiry into the origin of awns in cultivated rices was undertaken and investigation made to determine the nature and character of the partial awns in an apparently awnless variety. Investigation was carried on for four years and it has been found that an awnless variety may get partial awns and *vice versa*, and as such the awned character in all these cases is only the result of variation and not of crossing.

The new paddies which were received from the Penang Federated Malay States last year have been found to be too late for our rice season and have therefore been rejected.

Wild Rices.—The systematic study of wild rices has been continued. The types isolated before have been maintained. The habit of plants and their morphological characters, particularly those of the stem, inflorescence and glume are being studied. The character and nature of the natural crosses are under observation.

Cotton.—The chief aim in this crop is to improve the lint as regards quality, length and strength. With these ends in view and to suit local conditions single plant selections have been made in Chanda *jari*, Cambodia and various other cottons obtained from the United Provinces and the Punjab. In the Chanda *jari*, different types of plants with distinct habits have been isolated for growing in pure line cultures. In the Cambodia cotton two distinct types of plants have been isolated, *e. g.*, (1) early ripening with much branched habit, (2) late ripening with erect habit. These two types differ in the production of bolls and also in the quality of lint. Plants in the first type with branched habit produced more bolls and their lint was also superior owing to the early and rapid ripening of the bolls. Line cultures from these types are being grown at Chandkhuri and Nagpur for testing the permanency of these characters.

Some cross-breeding work has also been done and the F-1 generations are being grown on the Farm.

An early cotton with a high ginning percentage has been isolated, and sufficient seed handed over to the Deputy Director of Agriculture, Northern Circle, for trial on a field scale at Seoni and Betul Farms in the Plateau Division where frost causes great damage to the late varieties.

Early plants have been selected from the cotton known as "Aligarh White" which was obtained from the United Provinces. These plants yielded a percentage of lint varying from 44 to 47 and seem to be good yielders. Next year sufficient seed will be available for trial on a large scale.

Selected seed of Rosea with 41 ginning percentage has been given to the College Farm for trial.

A small quantity of pure seed of all the varieties has been obtained from the Imperial Cotton Specialist and is being grown in the Botanical area for reference.

Juars.—Natural crossing produced extreme complexity in some of the varieties and rendered the classification of this crop difficult, so that for the purpose of studying the unit characters and their behaviour with regard to the Mendelian proportions, artificial crosses were made between various juars. The behaviour of these characters in the F-3 generation of the crosses has been ascertained, and the knowledge gained would be useful for further work towards the classification of this important crop.

Six pure types of fodder juars with thin straw have been selected and handed over to Nagpur Farm.

Wheat.—The work in the wheats continues and the special points aimed at are yield, stiffness of straw, rust resistance and capacity of the glumes to hold grains. With these ends in view, more crosses were made and the F-2 and F-3 generations of the former crosses were tested at Jubbulpore and Nagpur. During the year, rust was very severe on these Farms and the crosses had thus luckily a stiff test. Those which got the rust have been discarded. A few strains seem very promising and may prove rust resistant. The cross Mediah × Jalalia seems very hopeful with regard to straw and immunity to rust. Other crosses which appeared comparatively immune to rust have also been kept on for further test.

The capacity to hold the grain is of great importance for those tracts in the North of the Province where hail storms cause immense damage to the crop. A cross between Bansi × Khapli was therefore made to achieve this end and the strains obtained from this cross possess this capacity in a remarkable degree, but unfortunately the quality of the grain is not up to the standard, and hence new blood into this cross will be introduced next year to bring it up to our requirement.

With a view to obtain suitable parents for our breeding work here, fifty single ears of various Types of wheats from Mesopotamia were kindly sent by Dr. Graham and were grown in duplicates on Nagpur and Jubbulpore Farms.

The selections which were made from Australian crosses and local wheats were handed over to the College Farm for trial on a field scale.

Potatoes.—The experiment on potatoes has been continued, the object being to get varieties resistant to bacterial rot.

The tubers from each seedling potatoes were collected separately and stored; and those which escaped the rot during the hot season were kept.

These tubers are now in their third generation and were propagated from the seeds obtained from the fruits (plums) of potatoes. In the first generation owing to the small amount of nutrition in the seed, the plants propagated were small and delicate, in consequence of which the tubers produced were rather small in size. In the next two generations the size has improved considerably and is likely to be better with each succeeding generation.

The breeding work will now be done on the newly opened Farm at Chhindwara and the crop will thus be under better control.

Castor.—Owing to its increasing importance in modern industries the investigation of this crop has also been taken in hand. The preliminary single plant selections of various types from the kharif and rabi crops have been made and are being grown for further work.

Orange garden.—(1) *Manurial Experiments.*—The series of experiments dealing with manures have been continued. Trees were arranged in rows. In each row there were twelve trees and in all sixteen rows. The rows were manured with nitrogenous manures while the lines were cross-dressed with non-nitrogenous manures. The object of the experiment was to find out the best combination of manures at a given cost which was taken at 2 annas per tree in the first year, rising by two annas annually to 10 annas in the fifth year when the trees should be in bearing. The following nitrogenous manures are being experimented with:—Cattle-dung, Green manure, Castor cake, mohwa refuse, calcium nitrate; the cross-dressings are of superphosphate, potash and superphosphate combined with potash. The weight of manure given to each tree varies with the kind of manure given and the combination used, but in every case the cost is limited to the fixed money value.

The effect of the nitrogenous manures on the vegetative growth of the trees is now quite distinct. The lines of trees which were treated with mohwa refuse are the most prominent. The foliage in these trees is dense, deep green and the branches are abundant. The trees treated with cake come second, and the rows of trees treated with cattle-dung and calcium nitrate stand third in order.

The effect of the non-nitrogenous manures so far cannot be said to be clearly noticeable; but their action in the flowers and in the formation of fruits is being watched in order to deduce definite results. The experiment will thus have to be continued for a few seasons more and it will then be possible to arrive at definite conclusions as to the nutritive and productive value of each kind of manure used.

(2) *Irrigation.*—In the orange garden the fully grown trees are now irrigated in two ways—(1) in permanent deep trenches, (2) in shallow temporary furrows. Permanent trenches have been made 1½ feet wide and about a foot deep and their level throughout is kept perfectly flat. But in

case there is much natural slope in the land the trenches have to be terraced in order to keep a uniform column of water throughout its length. In this way each tree gets an equal quantity of water.

The "Trench System" of irrigation is quite easy to work; and for places where the cultivator receives the canal water for a fixed number of hours it is distinctly to his advantage to fill in his trenches and to let the roots of the trees gradually absorb the water. The only drawback of this system is the difficulty of interculture. The amount of space between the rows of trees which is left after a trench has been made, is not wide enough to allow the working of a bullock-hoe (*bakhar*). Hence where irrigation is not from a canal and the supply of water not rapid, it is useful to adopt the furrow system. It consists in making temporary furrows by working the Monsoon plough up and down between the two rows of trees. Water is allowed to flow slowly in these furrows and the roots get their supply of water. Next day or the day after, the bullock-hoe (*bakhar*) is worked and all the furrows are obliterated. In this way the soil beneath the trees is kept well mulched and clean and free from weeds.

Botanical Garden.—Suitable new plants from Saharanpur, Calcutta, and Bombay have been obtained and added to the Natural Orders. All the plants in the garden have been relabelled.

The beds in some of the Natural Orders have been extended so as to allow the plants a free scope for growth. The system of hard pruning tends to give a wrong conception of the habit of the plants and should be avoided as far as practicable.

During the summer, owing to the shortage of water in the Phutala tank the plants in the garden had a bad season of drought to combat with and could get a very limited amount of water. The old well in the compound was, however, excavated and used for watering the more delicate plants. The lawns did not get any water, but they withstood the heat remarkably and recovered vigorously at the onset of the monsoon.

Herbarium.—Owing to the more important work in the Section and to the shortage of the staff, the work in this Section had to be kept in abeyance. Very little new collection could be added to the Herbarium. One full-time Assistant is needed for this Section to do justice to the investigation of the Flora of the Province.

Mycology.—The chief work done in Mycology in the Central Provinces includes the teaching of this subject to the students, the collection of specimens and the breeding of rust-resistant wheats and wilt-free cottons. Specimens were collected during the year, but places in the interior have yet to be explored. As soon as the collection is complete, a short list of "Diseases of Economic Plants" will be published. Meanwhile a small illustrated popular Bulletin dealing with only a few important fungoid diseases has been prepared and will be ready at an early date for publication.

The breeding of rust-resistant varieties of wheats has been continued. More crosses have been made. During the year under report, rust was very severe aud several strains apparently rust free were attacked and rejected accordingly. Those crosses which escaped the attack have been kept on and will be tested for one year more. The cross Mediah + Jalalia seems very promising. Other strains which appeared to be comparatively immune to rust have also been kept on.

Some pure strains from a local variety of cotton called "Bishnoor" which is said to be immune to wilt were selected and tested at Akola, but as the season was very dry no definite results could be obtained. Bishnoor is the name applied to the mixed *Jari* cotton found in certain villages of Katol Tahsil. They are under trial this year.

In conjunction with the Agricultural Chemist, pot culture experiments have been started to find out a cheap fungicide for wilted soils. The results obtained so far are not definite. During the cotton season a large number of plants were examined for wilt, and it is interesting to note that the disease attacked and killed the plants in the pot culture experiments in the young stage before the plants could come to flowers, while the diseased plants obtained from fields indicated that the death of plants in fields occurred at the flowering season when they were fully grown.

Other work.—Of the various seeds—lucerne, juar, wheat, melons, beans, &c.—obtained through the kindness of Dr. Graham from Mesopotamia, maize was one and did exceedingly well. It is an early variety and the cobs ripen in eight weeks only. As such it will form a good catch crop after irrigated wheats. Sufficient seed for trial on a field scale will be available next year.

As usual selected varieties of cereals, seeds of vegetables, flowers, forest trees, &c., were distributed during the year. In addition to seeds of various kinds, orange plants, cuttings of Guinea grass and sugarcane were also supplied to Mesopotamia, and Dr. Graham has written to say that they are thriving well.

K. P. SHRIVASTAVA,

Offg. Economic Botanist,

Central Provinces.

Report of the Agricultural Chemist, Central Provinces and Berar, for the year ending 30th June 1919.

Staff.—There has been no change in the *personnel* of the staff and the distribution of work remained the same as in last year. To cope with the increasing work in the analytical and teaching branches of this section, one or two more assistants will soon have to be entertained and trained. Mr. Bal, the Bacteriological Assistant, availed himself of two months' privilege leave. Mr. Ram Narayan's time was wholly taken up in teaching and, as more classes now come under instruction, I shared the work by taking all the lectures for the 4th year class and some for 3rd year. Mr. Desai was entrusted with all the routine work, and in his spare time assisted in the research work carried on in the laboratory. Mr. D. V. Bal delivered a course of lectures on Agricultural Bacteriology to fourth year students in addition to his work on biological problems. A report of his work is attached.

I have to acknowledge the zealous assistance given by all the assistants who co-operated with me and worked very well and willingly. Special mention may be made of Mr. Ram Narayan's successful teaching and of the promising research work which Mr. Bal has been carrying on.

Tours.—All the Experimental Farms with the exception of Hoshangabad and Sindewahi and some of the important oil mills of the Provinces were visited. Mr. Bal and I attended the First Sectional Conference of the Agricultural Chemists and Bacteriologists held at Pusa. I was deputed to conduct the examination in Agricultural Chemistry for the Diploma students of the Agricultutal College, Coimbatore. Mr. Bal was permitted to go to Bombay to read a paper at the Indian Science Congress. Visits were also made to Katol and Ubali for collecting samples of soils from orange gardens and to Tharsa and Adhartal for sugarcane analyses.

Equipment.—A small godown for storing oil and coal for which there has been a long felt need, was put up near the gas house.

It was impossible to get a regular supply of suitable scientific apparatus and chemicals and work in some cases was handicapped but, with the signing of peace, it is hoped that conditions will improve.

Education.—Owing to the introduction of the new syllabus, there were four classes under instruction for the first time in the College, and, consequently, a large number of hours had to be devoted to teaching. That the instruction was satisfactory and sound has been testified by the external examiner, and his report has been dealt with by the Principal, Agricultural College. The experience gained by my visits to Coimbatore, Sabour and Pusa Research Institutes enabled me to make some changes in the Chemistry curriculum.

I.—General Analytical Work.

This includes only the samples received for routine analyses and does not take into account the large number of analyses carried out under the heading of special investigations. The samples analysed are classified below :—

Manures	52
Feeding stuffs, oil seeds and cakes ...	17
Soils	5
Water	6
Miscellaneous	13
Total ...	93

The number of samples received for analyses from the public was slightly less in amount than in the last year. The examination of oil-seeds and oil-cakes was done, as in previous years, mostly for the various oil mills working in the Provinces.

Mechanical and Chemical analyses of *sehra* and *domata* soils from the new experimental area, Adhartal Farm, Jubbulpore, were carried out at the request of the Deputy Director of Agriculture, Northern Circle, and the analytical figures were supplied to him.

II.—Special Investigations.

A.—Dairy Products.

(1) Study of the specific effect of "rice konda" (when fed to milch cattle) on the composition of milk and butter fat.

In continuation of the investigations already carried out as regards the changes in the composition of milk and butter fat effected by feeding with different cakes, a new set of experiments was drawn up in conjunction with the Principal, Agricultural College, to study the effect of feeding the milch cattle with "rice polishings" or "rice konda." It was observed that butter produced in such cases was very hard, and was as good as that produced when the animals were fed with cotton cake and was much liked by customers. Feeding with rice polishings was comparatively less costly. The feeding ration consisted of linseed cake, chuni and rice konda. Samples of milk and butter fat were analysed, and from the analytical figures the following conclusions can be drawn :—

(*a*) The milk yield and the proportion of fat remained constant throughout the experiment.

(*b*) Butter fat showed high softening point, high saponification, Reichert meissl, Polenske, Kirchner and low Iodine values.

(*c*) In the eastern tracts of the Central Provinces where neither cotton seed nor cotton cake is generally available, rice konda is a valuable cattle food. By using it as a part of the ration, it counteracts the softening and other effects of linseed cake, and gives a harder butter similar to that produced by feeding with cotton seed or cake. It would thus tend to raise the quality of *ghi* produced in other tracts to that obtained from Wardha and similar districts where cotton seed forms an important part of a milch animal's diet.

(2) Study of the optimum ratio of concentrated food to milk yield.

This is in continuation of last year's experiment. Different amounts of concentrated food, ranging from 50 to 70 per cent to the milk yield, were tried on buffaloes at the College Dairy. In this connection about 500 samples of milk were analysed and the figures obtained seem to indicate that concentrated food equal to 60 per cent to the milk yield will be the optimum quantity.

B.—Pot Culture Experiments.

(*a*) A series of pot culture experiments on the growth of sann hemp on *bhata* soil subjected to varying manurial treatment were carried out. The following conclusions have been arrived at :—

(i) That inoculation of the *bhata* soil with black cotton soil shows much improvement in the growth of sann hemp and that inoculation combined with a dressing of til cake at the rate of 10 maunds per acre at sowing time gives the most promising results.

(ii) That sann hemp grown on this soil responds very well to phosphatic manures, especially super.

(iii) That lime has a very injurious effect.

The experiment is being repeated this year on a more elaborate scale.

(*b*) Another set of experiments with wilt soil, *i. e.*, soil from areas where cotton has been affected with wilt, was laid out using different chemicals such as sulphuric acid, copper sulphate, etc., as fungicides. It was found that treating the soil with chemicals had no effect in arresting wilt but heating the soil to moderately high temperatures had a marked effect and indicated that wilt can probably be controlled in the laboratory.

The experiment is being continued on a larger scale.

(*c*) A third set of experiments was conducted with a view to determine the best time to apply treated and untreated cakes to Rosea and Cambodia cottons growing on black soil. No conclusive results could be obtained by observation of the few plants grown in pots and the experiment will have to be conducted on a field scale.

C.—Citrus soil.

As mentioned in the last year's report, detailed chemical and mechanical analyses of soils from typical orange gardens were carried out. The soils from all good orange gardens contained a high proportion of lime. A summary of the results is being got ready.

D.—Juars.

The feeding values of all the principal varieties of juar seed grown in these Provinces have been determined. It has been noticed that besides the proportions of the ordinary nutrients, *viz.*, proteins, ether extract and carbohydrates, the amount of dextrine formed during the backing of juar bread had also to be taken as one of the factors in determining the popularity of juar as a food.

E.—Sugarcane.

At Tharsa about 50 analyses of cane juices from all the varieties in the observation series and of the seedling canes sent for trial by Dr. Barber were carried out. Some seedling canes were found to be very promising and ripened early. Next year they will be tested at intervals of one month beginning from the 9th month after planting.

At Adhartal a number of cane analyses was also done. Some varieties, which are not promising were rejected. In addition, the effect of different manures upon Green sport, Khari and Red Mauritius was studied. Farm yard manure gave the best result and *gulli* cake the poorest.

The analytical figures will be found in the respective farm reports.

F.—Experiments on Sewage Purification.

This year the experiment was continued with the following modifications :—

(1) Concentrated and dilute sewage was used for irrigation.

(2) Irrigations were given once and twice a week.

As in the previous year, the samples of sewage and drainage water received from shallow pipe drains were analysed. This work could not be completed as in the middle of the experiment the supply of sewage water became very irregular. However from the figures obtained, as far as the experiment could be conducted, the following points are noticed :—

(1) It was observed last year that about 45 per cent nitrogen could be recovered in the form of nitrate when the sewage used for irrigation contained from 12 to 15 parts of total nitrogen per 100,000.

(2) This year when sewage of nearly the same concentration was applied either once or twice a week, only 25 to 30 per cent nitrogen was found to have been made available in the form of nitrate.

(3) This shows that the rate of availability of the total nitrogen in sewage as measured from the amount of nitrates formed, is falling gradually.

(4) When dilute sewage containing 4 to 5 parts of total nitrogen per 100,000 was applied to the soil either once or twice a week, about 60 to 70 per cent nitrogen was made available.

(5) It therefore appears that to black cotton soil dilute sewage can be applied with greater advantage than the concentrated one, as the amount of nitrogen made available in the case of the former is much greater than that in case of the latter. But it cannot be said with certainty whether this high rate of availability of nitrogen will continue with the constant application of even dilute sewage.

III.—Miscellaneous.

In addition to the work above detailed, a certain number of analyses have been carried out which are not included under any of the above headings; of these the following may be mentioned:—

(1) Castor leaves were examined for the presence of Riein, the toxic body in castor seed, as it was reported that, in some places an idea prevails that cattle are poisoned by their eating castor leaves. This limits the expansion of castor cultivation. It was found that castor leaves do not contain any Ricin in appreciable quantity.

(2) At the request of the Indian Trade Commissioner, London, analyses of different varieties of eggs of country and farm-bred hens, turkeys, geese, etc., were carried out and a report on the analyses was supplied to him. On the whole the analyses of various eggs do not show any inferiority of the Central Provinces eggs to those of the United States of America as compared from the figures given by Langworthy in Farmer's Bulletin No. 128, U. S. Department of Agriculture. But in the average weight per egg there is a marked difference. The weight of a country hen's egg is about 35 gms. whereas that of a farm bred and American hen's egg is 46 and 53 gms. respectively.

(3) In pursuance of the resolutions passed at the Conference of Agricultural Chemists, this laboratory is to examine and standardize the methods used in the determination of various forms of Nitrogen. Some methods have been tried and the work is being taken up in spare time.

BACTERIOLOGICAL SECTION.

I.—Biological analysis of soils.

(*a*) *Embanked wheat soils of the Jubbulpore tract.*—Work on these soils was carried out more or less on the same lines as in the previous two years. The condition of the soil on all the plots was satisfactory in October this year. Nitrification figures also show a definite superiority over the figures of the last year. The amount of nitrogen nitrified by plots 1, 6 and 7 at the end of 8 weeks was 38·4, 42·7 and 29·9 per cent respectively this year as against 15·96, 29·84 and 21·32 per cent last year.

The outturn of wheat per acre from these plots for the last two years was as follows:—

				Grain in lbs.	
				1917-18.	1918-19.
Plot	I	...	...	589	677
„	VI	...	...	615	644
„	VII	...	...	534	420

Most of the preliminary work on these soils has been completed during the last two years and the results can be summarised in a concise form as follows:—

(1) With regard to the moisture content, it appears that, in a year of fairly good rainfall, an unembanked field is as good as an embanked one as the soil can only hold a certain amount of water. and to impound the water upon it does not make it retain any more. Should the rains stop early, which is generally unusual, conditions might be different, but apparently about 20 per cent of moisture is what the soil wants at sowing time. This year, even though late rain was rather scanty, plants from plots 1 and 6 did not suffer for want of water. As a result of the good mulch maintained on these plots, moisture was efficiently conserved for a sufficiently long period.

(2) These soils in general are quite good as regards nitrogen fixation and ammonification.

(3) Their oxidation power as measured by the relative rate of carbon di-oxide production is generally quite satisfactory. This power for promoting oxidation is of very great importance from the point of general decomposition of organic matter, whether the latter is in the form of soil reserve or is added from an external source as manure.

(4) Nitrification, though slow and weak, appears to be steadily improving with the aid of rainy weather cultivation. It is clearly seen that nitrification sets in very early and is much more vigorous in the case of plot 1 and to some extent in plot 6 than in plot 7. This fact explains why in the beginning the wheat seedlings appear yellow and weak in the case of embanked fields, and how by cultivation and aeration this defect can be rectified. Comparative tables of nitrification and wheat yield being too lengthy are not given here, but these clearly show the intimate relationship between the biological activities of the soil and its crop-producing power. Results obtained up to now are sufficient to emphasize the necessity of increasing such studies of biological nature in these soils.

(5) It appears reasonable to conclude that wheat seedlings in embanked field generally suffer in the earlier part of their life due to either lack of available nitrogen or to the accumulation of some toxic substances. This question will be studied with special attention this year. Whatever be the cause of stunted growth in the young plants, aeration, brought about by regular rainy weather cultivation, removes the defect very considerably.

(6) There have been certain defects in the field experiments, and these will be removed this year. These studies will be further continued with the necessary modifications and with more precise control over field trials.

(*b*) *Bhata and wilt soil.*—Pot culture experiments on the growth of sann hemp in *bhata* soil under varying conditions and cotton in wilt soil from Akola were carried out, and the results obtained are embodied in the report of the chemical section.

(*c*) *Sehar soil.*—Nitrification of various cakes and other organic manures was carried out in this soil in addition to the usual biological analysis. The results will be published along with those of the work done on similar lines in other soils.

II.—Determination of the relative availability of the various organic manures commonly used in the Central Provinces.

A part of this experiment dealing with the black cotton soil was completed and a paper on this subject was read at the 6th Indian Science Congress held at Bombay in January 1919. Further work on other soils of the Central Provinces is now completed.

III.—Decomposition of green manures.

Experiments relating to the decomposition of sann hemp (*Crotalaria juncea*) and Dainchya (*Sesbania aculeata*) at different periods during growing time have been started at the close of the year under report and are now in progress.

IV.—Nitrogen fixation.

At the last conference of Agricultural Chemists and Bacteriologists held at Pusa in February 1919, the Imperial Agricultural Bacteriologist pointed out that the problem of nitrogen fixation is most important and should be taken up where possible. Certain experiments have accordingly been instituted towards the end of the year under report.

V.—Miscellaneous.

Several analyses of sewage and drainage water from the sewage experimental area of the College farm were carried out in connection with the work on purification of sewage. Two samples of water were received from the Principal, Agricultural College, Nagpur, for bacteriological examination. These were examined and a report was duly furnished.

Publications.

1. The biological determination of the relative availability of various organic manures in black cotton soil of the Central Provinces by F. J. Plymen A.C.G.I. and D. V. Bal, L.Ag., Post-graduate (Pusa). Read at the last Indian Science Congress held at Bombay in January 1919.

2. Some Observations on the growth of clover crop in black cotton soil by D. V. Bal, L.Ag., Post-graduate (Pusa). Published in the Agricultural and Co-operative Gazette, Central Provinces, Volume 15, No. 3—1919.

A. R. PADMANABHA IYER,

Offg. Agricultural Chemist,

Central Provinces.

The Maharaj Bagh Menagerie.

The Menagerie has continued under the direct supervision of Mr. P. A. Shukla, who has in addition his teaching work at the College and care of the College and Telinkheri stock.

Construction.

Little except of minor character has been done. An attempt has been made to control the erosion in progress in the deer paddock. The water gate near the Sitabuldi road has been overhauled and repaired and strengthening has been done to the Bear pit bars. No further expansion or improvement is possible till steps are taken to construct the fresh monkey house planned in 1913 and to convert the present house into a small carnivora house. Both these get turned down each year, when put up as major or minor works as of no importance. Till however such work is done the Menagerie cannot improve substantially.

General.

The health of the animals has been most satisfactory. Deaths have been few and none of these of preventable type. The tables attached show the gains and losses during the year under report.

The Veterinary Inspector.

As noted above the Veterinary Inspector has a good deal of work outside.

205 animals at Telinkheri were inoculated against hæmorrhagic septicæmia and 160 with anti-rinderpest serum. The above action and other measures prevented the serious spread of the above diseases. The usual minor diseases and complaints have been dealt with on all farms.

Addition by presentation, purchase and births during 1918-19.

No.	Kind of animal.	Doner's name.
	By presentation.	
1	Four-horned deer	Hon'ble the Chief Commissioner, Central Provinces.
1	Pangolin	Station Master, Paras, Great Indian Peninsula Railway.
2	Monkeys	Police Officer.
3	Four-horned deer	Raja Sahib of Korea State.
1	Bear cub	Khan Bahadur A. A. Khan, Extra-Assistant Commissioner.
	By births.	
6	Spotted deer.	
2	Samber.	
6	Rabbit.	
5	Indian antelope.	
6	Guinea pigs.	
	By purchases.	
2	Burmese peacock.	
1	Hanooman monkey.	
31	Small birds.	

Reduction of animals by transfer, sale or death during 1918-19.

Names.	No.	Remarks.
By transfer.		
Male spotted deer to Telinkheri ...	1	
Indian antelope to Telinkheri ...	1	
Pythons to Museum ...	2	
By sale.		
Spotted deer	2	
Samber	1	
Rabbit	1	
By death.		
Deer	3	
Birds	11	
Bears	2	
Leopard	1	
Wild dog...	1	
Civit cat	1	
Indian Ratel	1	

R. G. ALLAN,

Principal,

Agricultural College, Nagpur.

Govt. Press, Nagpur.—No. 1458, Dir. of Agri.—18-12-19.—450.

Department of Agriculture, Central Provinces and Berar.

REPORT

ON THE

EXPERIMENTAL FARM

ATTACHED TO THE

AGRICULTURAL COLLEGE, NAGPUR,

FOR THE

Year ending the 30th June 1920

BY

S. T. D. WALLACE, B. Sc.,

OFFG. PRINCIPAL OF THE AGRICULTURAL COLLEGE, NAGPUR.

Nagpur

PRINTED AT THE GOVERNMENT PRESS

1921

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REPORT

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FOR THE

Year ending the 30th June 1920.

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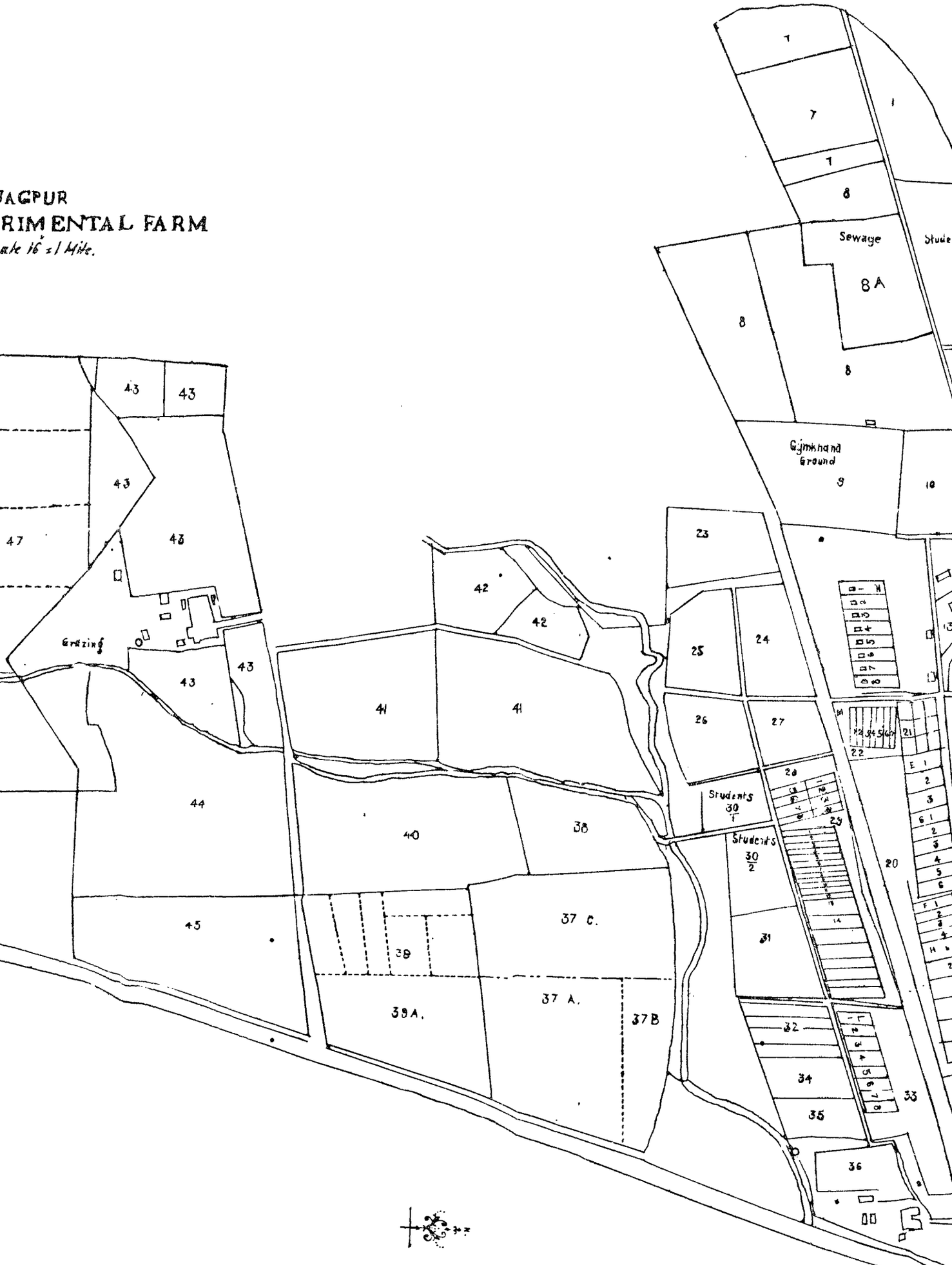
JAGPUR

RIMENTAL FARM

ale 16" = 1 Mile.



Annual Report of the Nagpur College Farm, 1919-20.

GENERAL.

Land Improvement.—In the year under report a further area of 3·95 acres in field No. 37 was under-drained. It has been found that under-drainage of the land on this Farm gives good results and the cotton crop is much improved in this way. It has been found in the course of these under-drainage operations that although the soil of a field may appear uniform, yet the subsoil in the same field may vary considerably from that of a sandy nature to a stiff clay. This probably accounts for the unevenness of a crop, over a field of apparently uniform nature, before under-drainage has been carried out. A considerable amount of ploughing was carried out during the hot weather, also cultivation, by means of a tractor.

Season.—The monsoon commenced early and the sowing of kharif crops was begun on the 10th of June; the rainfall between the 13th and 19th was, however, so heavy that sowing had to be suspended. The rainfall during July, August and October was normal, while in September it was much below normal. There was practically no rainfall from November to January and this reduced the yields of the rabi crops considerably. There was no rain during the cold weather and in consequence the land became very hard and ploughing could only be done with great difficulty.

Crops.—The sowing of kharif crops was done in time. Cotton germinated well, but it did not do well later owing to the excessive rainfall which caused water-logging. Most of this crop had to be ploughed in and the area put under rabi crop. The average outturn for cotton was 407 lbs. per acre. Juar also suffered from the excessive rainfall and gave a low yield.

The germination of rabi crops such as wheat and gram was good, but the young crop was badly infested with hoppers which did great damage, while the light rainfall in August and September, together with the absence of showers in the cold weather was also responsible for a small outturn.

Other Crops.—Linseed did very well and gave 410 lbs. per acre. Groundnut did well, while tur was below the average.

Clover did well on land where it had been grown before and gave an outturn of 30,000 lbs. per acre.

Implements and Machinery.—During the year under review two tractors have been purchased for trial, one of these called the "Cletrac" is on the "Catterpillar trac" system and the other is a "Fiat" of the four-wheeled type. A report of their work is given below. Extensive tractor trials were held on the Farm in the month of January 1920 and an opportunity was afforded of comparing the work of light and heavy types of tractors together with different makes of ploughs. A seed drill made in England and constructed to meet local requirements has also been purchased for use on the College Farm.

Fiat Tractor.—This is a powerful machine and was chiefly employed during the hot weather for ploughing. On the kharif fields it did very good work and with an "International Tractor Plough" attached it was capable of ploughing to a depth of 7 inches. About 3 acres a day could be ploughed with this double-furrow plough attached. The fuel consumption under these conditions was about 6 gallons kerosene per acre and $\frac{1}{3}$ gallon lubricating oil.

On the *rabi* area the ground was very hard and the plough frequently came to the surface. Under these conditions about 2 acres a day were ploughed and the consumption of kerosene was about $7\frac{1}{2}$ gallons per acre and $\frac{2}{3}$ gallon lubricating oil. The tractor was also tried with a very heavy bullock plough called the "S.A.E." and by this means it was possible to get down to a depth of 11 inches. A satisfactory hitch, however, is required as a strip of ground between every two-furrows was frequently left unploughed.

Cletrac Tractor.—This is a lighter machine than the one mentioned above and was used during the hot weather for driving stationary machinery. This it did very well and could work two cotton gins, one Pennsylvania threasher and a fodder cutter at the same time. In the monsoon it has been used for ploughing and cultivating and it was found possible to work the tractor under the same conditions as bullocks. With a cultivator or disc harrow 18 acres per day could be covered with a consumption of about 1¼ gallons of kerosene per acre.

The International plough is rather heavy for work in the monsoon and a lighter implement would be better—a light three-furrow plough has been ordered for this purpose.

These tractors were also used to pull a Martin Ditcher which seems a useful implement for making open ditches on cultivated ground, but further trials are necessary before definite conclusions can be drawn as to the general utility of this implement as a means of making drains.

Buildings.—The new granary built last year has cracked badly at one end and will have to be repaired after the present rains have ceased. A shed has been completed for the purpose of teaching carpentry and blacksmithy work and the necessary tools have also been provided.

Staff.—Mr. V. B. Dharmapurker was Superintendent of the Farm from the beginning of the year till 12th April 1920. Mr. N. G. Sule, Farm Overseer, then became Farm Superintendent, while Mr. Ramadhin Kamal Prasad was appointed Overseer. Mr. N. K. Pendse was in charge of the machinery and tractors.

A financial statement is given at the end of the report.

A large amount of experimental work has been carried out and the results of these experiments are tabulated in the statements attached.

S. T. D. WALLACE,
Offg. Principal,
Agricultural College, Nagpur.

The College Dairy Farm.

Buildings.—The new dairy laboratory which has been under construction was completed in January 1920 and is now equipped with the necessary apparatus for teaching dairying on up-to-date lines.

Live-Stock.—No additions were made to the herd by purchase of animals. There were a few cases of hæmorrhagic septicæmia at the beginning of the year under review. The spread of the disease was, however, checked by inoculation of the herd and there was only one death from the disease. Later in the year foot-and-mouth disease made its appearance, but the affected animals were promptly segregated and were successfully treated so that all recovered. This outbreak, however, caused a drop in the yield of milk from the herd at the time it would be felt most, *viz.*, the hot weather. Two Ayrshire crosses are now in milk, but as their record is not complete, nothing definite can be given in the way of results from the cross, but they promise to do well. Cross-bred bulls have not yet been used as sires. The mortality amongst the young stock was for buffalo calves 2 females and 3 males, whilst in the cow herd 3 calves died. Most of the mortality amongst calves is due to pneumonia.

Fodder-supply and water were again difficult this year as Telinkheri was unable to supply all the hay required and the animals could not be kept on the Bori grass reserve for more than four or five months owing to the scarcity of water there. Silage grown on the Farm was fed to the animals during the hot weather but as mentioned above the supply of hay was deficient.

Dairy Produce.—Most of the milk is sold as whole milk and is primarily meant for the use of young children. The demand for milk is greater than the supply but the aim of the dairy is to increase the milk yield by careful selection. A number of small cream cheese were made and these met with a ready sale. Owing to the greatly increased cost of all food-stuffs the profits from the dairy were much less than last year.

Statements are attached showing the milk yield of individual-animals in the herd, also receipts and expenditure.

Mr. J. V. Takle was Dairy Manager and in addition to supervising the general management he gave practical instruction and lectures on dairying to the College students. One student from the United Provinces was given a six months' course in practical dairying.

During the year the dairy was visited by a large number of people.

S. T. D. WALLACE,

Offg. Principal,

Agricultural-College, Nagpur.

Cropping scheme showing the total area of

Field No.	Total area sown	Fallow.	Tarwar.	Peas.	Castor.	Cotton	Juar.	Tur.	Fodder.	Wheat.	Gram.	Linseed.	Experiment.	2nd year.	3rd year.	Clover.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1	...	...	...	...	...	2·80	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	2·00	9·60	...	...
3	...	...	...	...	...	...	...	...	...	..	0·74	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	..	1·41	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	6·69	1·30	.	...	...	...	...
6	...	...	...	...	...	...	...	...	...	4·15	...	...	...	...	...	...
7	...	2·50	...	..	...	...	...	...	...	...	3·60	...	...	...	...	...
8	...	...	...	...	...	2·36	...	...	...	...	12·41	...	..	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	·25	...	·20	...	...	...	...	...	1·75	...	...	...	...	...	1·00
12	...	·17	...	...	...	...	...	...	...	...	·68	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	·22	...	...	...	...	...	...	...	...	...	...	...	...	·21	...
15	...	...	...	...	...	...	...	...	...	...	4·63	...	...	...	...	...
16	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	·40	...	...	...	...	...	...	...	...	...	...	...	...	·90	...
20	...	...	...	...	...	...	...	...	...	3·41	...	...	3·77	...	...	·72
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	67	...	·07	...	·56	..	...	...
23	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	·97	...	...	1·35	...	...		...	...	..		...	...	...
27	...	...	...	...	...	...	0·30	...	1·14	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	·62	...	...	...	...	...	...	..
29	...	...	...	...	...	1·16	...	...	...	...	...	...	1·60	...	·80	...
30	...	...	...	...	...	1·55	...	...	...	...	...	...	...	·70	...	...
31	..	...	...	...	...	2·56	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	2·00	...	...	...	...	...	...	...	...	...	...
33	...	..	...	...	...	3·16	...	...	...	...	..	...	·80	...	...	...
34	...	...	...	...	...	1·16	...	...	...	...	...	...	...	..	...	...
35	...	...	..	...	...	1·12	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	1·52	...	...	...	...	...	...	...	...	...	...
37	..	2·00	...	..	0·20	...	2·00	...	...	2·16	6·00	3·00	...	...	...	...
38	...	...	...	...	...	...	...	...	4·42	...	...	..	...	...	...	3·00
39	...	...	...	·75	...	...	...	...	..	...	2·04	7·25	...	...	...	...
40	...	...	...	..	..	10·83	..	...	...	...	.	...	...	...	...	...
41	...	...	...	...	...	...	...	...	15·12	...	...	...	...	..	...	...
42	...	..	...	..	...	...	...	...	3·55	...	...	.	...	...	...	...
43	...	...	...	...	...	...	...	...	16·25	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	8·27	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	8·63	...	...	...	...	...	...
46	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...
47	...	...	...	...	...	...	...	...	17·05	...	...	...	...	...	...	...
Total area sown with crops.		5·54	0·97	0·95	0·20	31·57	2·30	8·27	58·82	26·79	34·38	10·25	8 73	10·30	1·91	4·72

N. B.—Figures *in italics*

field sown with various crops during 1919-20.

with crops (in acres.)

Economic Botanist.	Building.	Waste.	Oats.	Sewage Farm.	Cricket field.	Maharajbag.	San for fibre.	Tilli.	1st year.	Wheat varieties.	Observation series.	Small Japan groundnut.	Raipur local groundnut.	Sida.	Total area of the field sown with various crops.
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	2·80
...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	11·60
...	...	0·31	...	...	...	...	...	...	...	...	...	...	...	...	1·05
...	...	...	..	...	...	...	...	...	...	...	..	...	...	...	1·41
...	..	...	...	...	...	..	...	...	...	...	...	...	...	...	7·99
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4·15
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6·10
...	...	...	...	3·50	...	...	...	..	...	...	·40	...	...	...	18·67
...	...	..	...	...	5·22	...	...	...	...	...	...	...	...	...	5·22
...	...	...	...	...	...	...	...	...	...	3·00	...	...	...	...	3·00
...	...	...	·25	...	...	...	...	...	...	3·44	...	...	...	...	6·89
...	·31	...	...	...	...	...	...	...	...	...	...	...	...	...	1·16
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	·02	...	...	...	...	...	...	...	...	1·00	...	1·00	·29	...	1·74
5·06	...	·52	...	...	...	·56	...	...	...	...	...	...	...	...	10·77
...	...	·98	...	...	...	...	...	...	...	...	...	...	...	...	·98
...	...	...	...	...	...	·68	..	...	...	...	...	...	...	...	·68
...	...	...	...	...	...	5·40	...	...	...	...	...	...	...	...	5·40
...	...	...	...	...	...	2·72	...	...	...	...	...	...	...	...	4·02
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7·18
·72	...	...	...	...	...	...	...	...	...	...	...	...	...	...	·72
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·23
2·66	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2·66
2·29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2·29
2·36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2·36
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2·32
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·44
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·67
...	...	...	...	...	...	...	...	...	...	...	...	...	...	·05	3·56
...	...	·15	...	...	...	...	...	0·10	..	..	·40	...	...	...	2·90
...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	2·56
...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	2·00
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3·96
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·16
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·12
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·52
...	...	...	...	...	...	...	...	0·10	...	...	...	...	...	...	15·46
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4·42
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10·94
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10·83
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15·12
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3·55
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16·25
...	...	...	...	...	...	...	6·15	...	...	...	...	...	...	...	14·42
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8·63
...	...	11·64	...	...	...	...	...	...	...	...	...	...	...	...	11·64
...	...	...	...	...	...	...	6·75	..	...	...	...	...	...	...	23·80
13·09	0·33	13·60	0·25	3·50	5·22	9·36	12·90	·20	...	7·44	0·80	1·00	0·29	0·05	268·34

indicate double cropping.

RAINFALL, 1919-20.

Months.	Number of rainy days.	Rainfall.	Average of preceding 45 years.	Remarks.
		Inches.	Inches.	
June 1919 ... 1st half	10	11·10	2·80	
2nd „	7	4·69	5·52	
July „ ... 1st „	10	6·59	6·34	
2nd „	7	5·96	6·90	
August „ ... 1st „	9	7·14	6·95	
2nd „	9	3·79	5·77	
September „ ... 1st „	4	0·85	5·48	
2nd „	5	2·22	4·30	
October „ ... 1st „	3	3·27	3·31	
2nd „	1	1·43	1·00	
November „ ... 1st „	...	...	0·94	
2nd „	1	0·30	2·30	
December „ ... 1st „	...	...	0·61	
2nd „	...	...	0·13	
January 1920 ... 1st „	1	0·33	0·31	
2nd „	...	...	0·33	
February „ ... 1st „	...	...	0·26	
2nd „	...	...	0·24	
March „ ... 1st „	...	...	0·20	
2nd „	1	0·75	0·21	
April „ ... 1st „	1	0·38	0·17	
2nd „	...	...	0·25	
May „ ... 1st „	...	...	0·21	
2nd „	...	...	0·33	

SERIES E-A.—SUBJECT.—Effects of tillage to various depths on wheat grown continuously without irrigation.

Area of each plot is ·125 acre.

Plot No. 1.—Scarified (bakhared) every year.
„ 2.—Ploughed once with country plough and scarified.
„ 3.—Ploughed once with inversion plough and scarified.

Plots manured with four tons of farm-yard manure per acre in the year under report.

No. of plot.	Outturn per acre.										Cost of special treatment per acre over that of bakharing.	Cost of cultivation per acre.	Value of produce per acre.	(Remarks.) Net profit.
	Average from 1901-02 to 1905-06.		Average from 1906-07 to 1910-11.		Average from 1911-12 to 1915-16.		Average of 3 years from 1916-17 to 1918-19.		1919-20.					
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	573	707	533	778	401	541	275	389	264	352	...	24 5 0	33 11 9	9 6 9
2	655	819	590	893	544	617	317	394	112	176	0 11 0	25 0 0	14 10 3	10 5 9
3	689	905	620	928	550	610	382	484	256	184	0 15 0	25 4 0	30 11 10	Loss. 5 7 10

SERIES E-B.—SUBJECT.—Effects of tillage to various depths on wheat grown continuously without irrigation.

Area of each plot is ·125 acre.

Plot No. 1.—Scarified (bakhared) every year.
" 2.—Ploughed once with country plough and scarified.
" 3.—Ploughed once with inversion plough and scarified.

Plots not manured.

No. of plot.	Outturn per acre.										Cost of special treatment per acre over that of bakharing.	Cost of cultivation per acre.	Value of produce per acre.	Net profit.
	Average from 1901-02 to 1905-06.		Average from 1905-06 to 1910-11.		Average from 1911-12 to 1915-16.		Average of 3 years from 1916-17 to 1918-19.		1919-20.					
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	573	707	533	778	491	541	303	392	192	240	...	12 5 0	24 5 4	12 0 4
2	655	819	599	893	544	617	364	416	104	144	0 11 0	13 0 0	13 5 8	0 5 8
3	689	905	620	928	540	610	308	385	184	280	0 15 0	13 4 0	23 15 1	10 11 1

The growth of wheat in this and the previous series was poor.

SERIES F.—Tillage experiment on rabi crops.

Area of each plot is ·15 acres.

Plot No. 1.—Ordinary cultivation.
" 2.—Ploughed in hot weather and frequent tillage.
" 3.—Ordinary tillage with manure four tons per acre in wheat years.
" 4.—First ploughed in May, second in the middle of August and frequent tillage.

Rotation.—Wheat two years and gram one year.
Crop.—Wheat in the year under report.

No. of plot.	Outturn per acre.								Value of produce per acre.	Cost of cultivation per acre.	Profit per acre.	Remarks.
	Average of wheat for 5 years, 1910-11, 1911-12, 1913-14, 1914-15 and 1916-17.		Average of grain for 3 years from 1912-13, 1915-16 and 1918-19.		Wheat, 1917-18.		Wheat, 1919-20.					
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.				
1	2	3	4	5	6	7	8	9	10	11	12	13
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	684	711	663	798	307	507	407	847	55 13 0	12 0 0	43 13 0	
2	728	756	740	836	360	573	467	553	58 12 10	19 2 0	39 10 10	
3	787	815	830	1,024	313	487	553	807	71 8 6	24 0 0	47 8 6	
4	840	884	863	917	353	463	573	727	72 12 1	19 13 0	52 15 1	

SERIES H-A.—Effect of interculture and spacing on rabi crops.

Area of each plot is ·29 acre.

Plot No. 1.—Lines 12″ apart, seed rate 80 lbs. wheat and 40 lbs. gram per acre.
„ 2.—Lines 18″ apart, seed rate 80 lbs wheat and 40 lbs. gram per acre.
„ 3.—Lines 12″ apart, half seed rate of the first.
„ 4.—Lines 18″ apart, half seed rate of the second.

Rotation.—Wheat two years and gram one year.
Crop.—Wheat in the year under report.

No. of plot.	Outturn per acre.								Value of produce per acre.	Cost of interculture per acre.	Remarks.
	Average of wheat for five years' 1910-11, 1911-12, 1913-14, 1914-15 and 1916-17.		Average of gram for three years' 1912-13, 1915-16 and 1918-19.		Wheat, 1917-18.		Wheat, 1919-20.				
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.			
1	2	3	4	5	6	7	8	9	10	11	12
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	
1	646	709	742	876	343	517	466	566	58 13 8	...	
2	753	804	687	758	376	495	562	745	71 12 1	0 11 0	
3	736	782	414	598	328	450	517	652	65 9 6	...	
4	769	843	471	692	274	391	500	576	62 12 2	0 11 0	

SERIES H-B.—Tillage experiments on *rabi* crops.

Area of each plot is ·14 acre.

Plot No. 1.—Ploughed with Turnwrest plough in the beginning of rains and with monsoon plough in the middle of August and frequent bakharings.
„ 2.—Ploughed with Turnwrest plough in the beginning of rains and frequent bakharings.
„ 3.—Ordinary tillage with 4 tons manure per acre in wheat years.
„ 4.—Ordinary tillage and no manure.

Rotation.—Wheat two years and gram one year.
Crop.—Wheat in the year under report.

No. of plot.	Outturn per acre.						Value of produce per acre.	Cost of cultivation per acre.	Profit per acre.	Remarks.
	Average of gram for two years' 1915-16 and 1918-19.		Average of wheat for two years' 1916-17 and 1917-18.		Wheat, 1919-20.					
	Grain.	Straw.	rain.	Straw.	Grain.	Straw.				
1	2	3	4	5	6	7	8	9	10	11
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	729	899	469	594	557	629	69 12 0	14 11 0	55 1 0	
2	746	955	4 9	53	543	621	68 1 6	13 5 6	54 12 0	
3	594	721	375	471	321	343	39 15 3	24 5 0	15 10 3	
4	639	791	330	416	371	386	46 0 9	12 5 0	33 11 9	

SERIES I-A.—Kharif rotation experiments.

Area of each plot is ·10 acre.

No. of plots.	First year.	Second year.	Third year.	Fourth year.
1	2	3	4	5
1	Cotton ...	Juar ..	Tur ...	Cotton.
2	Do. ...	San ...	Juar ...	Juar fodder.
3	Do. ...	Tur ...	Juar ...	Tilli or linseed.
4	Do. ...	Pulse ...	Cotton ..	Juar and pulse fodder.

Outturn per acre.

No. of plots.	1910-11.			1911-12.			1912-13.			1913-14.		
	Crop.	Lint.	Seed.	Crop.	Grain.	Straw.	Crop.	Grain.	Straw.	Crop.	Grain.	Straw.
1	2	3	4	5	6	7	8	9	10	11	12	13
		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.
1	Cotton.	70	131	Juar.	1,165	...	Tur.	612	1,855	Cotton	263	412
2	Do.	50	91	San.	...	...	Juar.	2,315	8,057	Fod der. and Juar.	...	5,020
3	Do.	90	174	Tur.	1,254	4,100	Do.	2,095 Lint	6,850 Seed	Tilli.	310	853
4	Do.	110	205	Kulthi.	240	434	Cotton.	410	807	Fodder.	...	4,980

Outturn per acre.

1914-15.			1915-16.			1916-17.			1917-18.		
Crop.	Lint.	Seed.	Crop.	Grain.	Straw.	Crop.	Grain.	Straw.	Crop.	Grain.	Straw.
14	15	16	17	18	19	20	21	22	23	24	25
	lbs.	lbs.		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.
Cotton ...	239	359	Juar ...	905 Fibre.	9,405	Tur ...	990	4,160	Cotton ..	28	42
Do. ...	246	370	San ...	320	...	Juar ...	415	3,850	Fodder and Juar.	...	5,060
Do. ...	258	387	Tur ...	1,000	2,600	D...	365 Lint.	3,140 Seed	Linseed ...	275	565
Do. ...	235	352	Do. ...	1,175	2,915	Cotton ..	132	159	Fodder and juar.	...	7,080

Outturn per acre.

1918-19.			1919-20.				
Crop.	Lint.	Seed.	Crop.	Lint.	Seed.	Value of produce per acre.	Remarks.
26	27	28	29	30	31	32	33
	lbs.	lbs.		lbs.	lbs.	Rs. a. p.	
Cotton ...	..	...	Cotton ...	146	219	106 12 5	
Do. ...	...	...	Do. ...	180	270	131 10 9	
Do. ...	...	...	Do. ...	164	246	119 15 4	
Do. ..	...	...	Do. ...	208	312	152 2 5	

SERIES I-B.—Tillage experiments with rotations.

Area of each plot is ·10 acre.

		1st year.	2nd year.	
Plot No.	5.—	Cotton	Juar	... Ordinary tillage and no manure.
,,	6.—	,,	,,	... Frequent ,, ,,
,,	7.—	,,	,,	... Ordinary tillage with 4 tons farm-yard manure.
,,	8.—	,,	,,	... Ploughing first, then frequent interculture.

No. of plots.	Out turn per acre.						Value of produce per acre.	Remarks.
	Average of cotton for 5 years, 1910-11, 1912-13, 1914-15, 1916-17 and 1918-19.		Average of juar for four years, 1911-12, 1913-14, 1915-16 and 1917-18.		Juar, 1919-20.			
	Lint.	Seed.	Grain.	Straw.	Grain.	Straw.		
1	2	3	4	5	6	7	8	9
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	
5	174	293	901	4,459	Failure.	Failure.	...	
6	170	285	859	4,225	,,	,,	...	
7	210	345	914	4,852	,,	,,	...	
8	199	324	879	4,323	,,	,,	...	

SERIES I-C.—To ascertain the effect of under-drainage on kharif crops with and without manure.

Area of each plot ·20 acre except 11-*a*, and 11-*b* which are ·10 acre each.

Plot No,	9.—Not drained	and	no manure.
,,	10.—Underdrained	,,	,,
,,	11-(*a*)—	,,	,,
,,	11-(*b*)—	,,	and manured with cattle-dung four tons per acre with top dressing of sodium nitrate giving 10 lbs. nitrogen per acre.
,,	12.—	,,	and ,,
,,	13.—Not drained	,,	,,

Crop—Cotton in the year under report.

No. of plots.	Outturn of kapas per acre, 1918-19.	Outturn of kapas per acre, 1919-20.	Value of kapas per acre.	Remarks.
1	2	3	4	5
	lbs.	lbs.	Rs. a. p.	
9	657	120	35 1 9	
10	737	200	58 8 4	
11 (*a*)	715	195	57 0 11	
11 (*b*)	800	465	136 0 11	
12	740	477	139 10 11	
13	817	457	136 13 4	

SERIES L.—To test the value of artificial manure for cotton. Area of each plot is ·10 acre.

Plot No. 1.—Sodium nitrate equal to 20 lbs. nitrogen per acre, superphosphate equal to 50 lbs. phosphoric acid per acre, sulphate of potash equal to 35 lbs. potash per acre.

,, 2.—Without sulphate of potash only.

,, 3.— ,, superphosphate.

,, 4.— ,, ,, and sulphate of potash.

,, 5.— ,, sodium nitrate only.

,, 6.—Sulphate of ammonia equal to 20 lbs. nitrogen per acre.

,, 7.—Superphospate only.

,, 8.—Unmanured.

No. of plots.	Outturn per acre.								Value of produce per acre.	Cost of manure per acre.	Value deducting cost of manure.	Remarks.
	Average from 1906-07 to 1910-11, 5 years.		Average from 1911-12 to 1915-16, 5 years.		Average of three years 1916-17, 1917-18 and 1918-19.		1919-20.					
	Lint.	Seed.	Lint.	Seed.	Lint.	Seed.	Lint.	Seed.				
1	2	3	4	5	6	7	8	9	10	11	12	13
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	200	367	212	357	159	238	134	201	98 0 4	56 14 4	41 2 0	
2	180	333	218	368	148	222	121	181	88 7 8	49 9 10	38 13 10	
3	197	360	203	349	146	222	134	201	98 0 4	29 13 6	68 2 10	
4	182	342	208	358	123	185	106	159	77 8 7	22 9 0	54 15 7	
5	119	219	136	230	82	124	72	108	52 10 8	34 5 4	18 5 4	
6	79	143	161	269	133	200	100	150	73 2 5	15 11 0	57 7 5	
7	97	180	117	197	70	119	45	67	32 14 2	27 0 10	5 13 4	
8	97	176	108	187	58	86	46	69	33 10 5	...	33 10 5	

SERIES M.—To determine the comparative value of cattle-dung and urine as manures, the urine being conserved by dry-earth system.

Area of each plot is ·08 acre.

Plot No. 1.—Dung and urine of 2 bullocks for 30 days, urine conserved by dry earth system.

,, 2.—Dry excreta alone of 2 bullocks for 30 days.

,, 3.—Urine alone of 2 bullocks for 30 days conserved in dry earth.

,, 4.—No manure.

,, 5.—Same as plot No. 1.

,, 6.— ,, ,, 2.

,, 7.— ,, ,, 3.

Crop—Fodder juar followed by wheat up to 1915-16 and by gram from 1916-17.

No. of plots.	Outturn per acre.												Remarks.
	Maize and juar fodder followed by wheat						Juar fodder follwed by gram.						
	Average of maize, fodder and wheat for 5 years from 1906-07 to 1910-11.			Average of juar, fodder and wheat for 5 years from 1911-12 to 1915-16.			Average of juar, fodder and gram for 3 years, 1916-17 1917-18 and 1918-19.			Juar, fodder and gram, 1919-20.			
	Maize fodder.	Wheat grain.	Wheat straw.	Juar fodder.	Wheat grain.	Wheat straw.	Jwar fodder.	Gram seed.	Gram straw.	Jwar fodder.	Gram seed.	Gram straw.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
1	4,358	447	585	13,428	269	296	11,518	952	1,138	Failure.	575	1,025	
2	4,167	336	464	10,806	255	270	7,254	855	1,004	,,	600	712	
3	4,623	359	485	11,649	209	246	8,629	733	1,037	,,	650	1,012	
4	2,858	313	419	5,769	170	190	4,006	629	914	,,	475	987	
5	4,454	462	572	12,159	274	239	9,992	921	1,077	,,	725	950	
6	3,805	382	503	8,766	222	245	7,008	752	1,014	,,	637	994	
7	2,794	364	482	10,131	199	223	8,488	612	879	,,	500	831	

SERIES N.—SUBJECT.—To test the effect of different cultural treatments preparatory to sowing wheat.

Area of each plot is · 10 acre.

No. of plot.	Treatment.	Crop.	Out turn per acre.					
			Average for five years from 1909-10 to 1913-14.		Average for five years from 1914-15 to 1918-19.		1919-20.	
			Grain.	Straw.	Grain	Straw.	Grain.	Straw.
1	2	3	4	5	6	7	8	9
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
5	Fallow ...	...	...	...	...	...	...	...
16	Do. ...	...	...	...	...	..	...	...
6	Ploughed in hot weather and bakhared in rains.	Wheat ..	521	724	330	403	170	410
7	Bakhared in rains ...	,, ...	537	736	271	348	120	290
14	Not cultivated till after the rains are over.	,, ...	365	451	125	182	220	380
8	San ploughed in early ...	,, ...	663	908	314	380	290	480
9	San ploughed in late ...	,, ..	544	628	302	418	220	420
10	San ploughed in early with a dressing of two maunds superphosphate at sowing.	,, ...	704	803	332	436	370	600
11	San ploughed in late and treated with lime at ploughing.	,, ...	463	622	302	321	180	480
12	San ploughed in very late ...	,, ...	417	581	159	265	250	470
13	Double cropping, first crop leguminous for fodder.	San	...	5,856	...	3,025	Failure	...
	Second crop for wheat ..	Wheat ..	486	672	351	487	240	400
15	Double cropping, first crop for fodder.	Sorghum .	...	2,020	..	2,794	Failure	...
	Second crop for wheat.	Wheat ...	270	405	157	268	230	500
17	Double cropping first crop legume for seed.	Mung ...	164	1,038	...	1,661	Failure	..
	Second crop for wheat ...	Wheat ...	363	455	251	367	310	530
18	San ploughed in alternate years with superphosphate	,, ...	196	291	308	374	300	520
19	San ploughed in alternate years ...	,, ...	142	219	278	360	300	520
20	San ploughed in every third year ...	,, ...	124	223	218	320	190	380

SERIES O.—To ascertain the comparative effects of urine earth, sodium-nitrate and treated cake on plots equally manured with cattle-dung.

Area of each plot is ·10 acre.

Plots No. 1 & 8—Cattle-dung 4 tons and sodium nitrate 10 lbs. nitrogen per acre as top-dressing.

„ 4 & 5—Cattle-dung 4 tons and urine-earth 4 loads per acre before sowing.

„ 3 & 6—Cattle-dung 4 tons and treated cake 10 lbs. nitrogen per acre as top-dressing.

„ 2 & 7—Cattle-dung 4 tons and urine-earth 4 loads per acre before sowing, and cake 10 lbs. nitrogen per acre as top-dressing.

No. of plots.	Outturn of Ikapas, 1919-20.		Value of produce per acre.	Average outturn per acre.		Remarks.
	Lint.	Seed.		Lint.	Seed.	
1	2	3	4	5	6	7
	lbs.	lbs.	Rs. a. p.	lbs.	lbs.	
1	208	312	152 2 5	253	379½	
8	298	447	217 15 10			
4	334	501	244 5 2	301	451½	
5	268	402	196 0 8			
3	336	504	245 12 6	301	451½	
6	266	399	194 9 3			
2	324	486	237 0 1	315	472½	
7	306	459	223 13 5			

All the above plots suffered very much from cotton wilt especially plots Nos. 1 and 5.

STATEMENT I.

Showing the total area and total yield of crops grown on the Agricultural College Farm, Nagpur, for the year ending 30th June 1920.

Crops.	Area in acres.	Yield in lbs.
1	2	3
(A) EXPERIMENTAL AREA.		
(1) *Kharif Crops*—		
Fodder (green)	...	...
Fodder (hay)	...	...
Tur	...	...
Cotton	3·00	1,67
Soybeans	...	...
(2) *Rabi Crops*—		
Howra wheat	5·69	2094·5
Gram	00·56	333
(B) NON-EXPERIMENTAL AREA.		
(1) *Kharif Crops*—		
Cotton	31·57	12861
Juar for seed	2·00	1773
Juar fodder	56·23	2,568 grain 224,920 fodder
Juar varieties	·30	400
Juar fodder for seed	2·59	753
Tur for seed	8·27	2,042
San (hemp)	12·90	1,980 seed
Groundnut, Raipur Local	0·29	295
Groundnut, Small Japan	1·00	762
Sida	0·05	24 fibre
(2) *Rabi Crops*—		
Haora wheat	26·79	5,95[illegible]
Haora varieties	7·44	1,908
Gram	34·38	7,240
Peas, ordinary	0·95	302
Lakh	...	...
Linseed varieties	10·25	4,214
Tilli	0·20	21
1st year students, area	...	...
2nd year students, area	10·30	...
3rd year students, area	1·91	323 lbs. juar
Observation area	0·90	...
Botanical area	13·09	...
Sewage area	3·50	...
Fallow	5·54	...
Tarwar	0·97	...
Castor	0·20	51
Clover	4·72	141,600
Oats	0·25	3 grazed

STATEMENT I (*a*).

Showing yield of varieties of wheat in 1919-20.

Name of variety.	Outturn per acre.	Remarks.
A.O .95 ...	804	Early.
Haora ...	687	,,
No. 4 ...	495	,,
No. 13 ...	304	,,
A.O. 89 ...	839	Late.
Pusa 12 ...	517	,,
No. 112 ...	761	,,

STATEMENT I (*b*).

Showing the outturn of juar Hay from the test fodder plots of 1/80th of an acre.

No.	Name of the varieties.	Outturn per acre.	Remarks.
1	Colliar	4,860	
2	Ambar	5,440	
3	Utaoli	4,480	
4	Nilwa	5,200	
5	Ramkel	6,400	
6	Lamkansi	8,160	
7	Pĕria Mangul Cholum	2,560	
8	Hundi	2,720	
9	No. 185	4,800	
10	No. 125.	5,600	
11	No. 120	4,160	
12	No. 124	2,560	
13	No. 114	3,660	
14	No. 130	4,880	
15	Sundia	2,240	

STATEMENT II.

Showing the account of Receipts and Expenditure under various heads of the Agricultural College Farm, Nagpur, for the financial year 1919-20.

Detailed Heads.	Amount.	Total.
1	2	3
RECEIPTS.	Rs. a. p.	
(1) Commercial sale of produce	8,959 9 2	
(2) Sale of seeds	2,180 14 9	
(3) Rent on Government wet land	644 8 0	
(4) „ „ dry „	727 12 0	
(5) Dairy produce including sale of animals ...	8,093 2 3	
(6) Miscellaneous	400 1 11	
(7) Sale of implements	118 0 0	
		21,124 0 1
(8) Grain fed to cattle	351 0 6	
(9) Seeds sown on the Farm	752 13 6	
(10) Estimated savings due to fodder produced on the Farm and fed to cattle.	2,249 0 0	
(11) Cattle-dung manure. (*a*) Farm ... Rs. 200; (*b*) Dairy ... „ 600	800 0 0	
(12) Dairy produce used. (*a*) Calf feeding Rs. 1,186-11-4; (*b*) Experiments „ 103-15-7	1,290 10 11	
(13) Transfer of animals	1,025 0 0	
(14) Increased value of young stock	635 0 0	
		7,103 8 11
Grand Total of the Receipts ...	...	28,227 9 0
EXPENDITURE.		
(1) Establishment's pay (Farm)	4,367 7 9	
(2) Travelling allowance (Farm)	52 14 0	
		4,420 5 9
COUNTERSIGNED CONTINGENCIES.		
(3) Charges for seed grain	220 8 4	
(4) Farm buildings	206 14 11	
(5) Construction and repair of Roads and Irrigation works.	599 12 4	
(6) Purchase of cattle and implements ...	881 7 6	
(7) Feed and care of cattle	13,218 3 7	
(8) Servants paid from Contingent Grant— (*a*) Permanent servants including war and grain allowance ... Rs. 5,241-0-6; (*b*) Variable labour ... „ 3,311-7-5	8,552 7 11	
(9) Manure	626 8 0	
(10) Service Postage Stamps and Telegrams ..	60 0 0	
(11) Country stationery purchased locally ..	4 0 0	
(12) Miscellaneous. (*a*) Farm ... Rs. 1,269-6-8; (*b*) Dairy ... „ 1,800-0-1	3,069 6 9	
		27,439 5 4
Total Working of the Farm ...	...	31,859 11 1
NON-RECURRING EXPENDITURE.		
(13) Dairy stock (animals)	...	
(14) Farm stock (animals)	...	
(15) Farm buildings	1,031 11 9	
(16) Construction and repair of Roads and Irrigation works.	499 4 11	
(17) Establishment associated with College work ...	1,356 10 8	
		2,887 11 4
GRAND TOTAL ...	...	34,747 6 5

APPENDIX I.

Showing the account of Receipts and Expenditure under different heads for 1919-20.

Returns.				Amount.	Expenditure.					Amount.
				Rs. a. p.						Rs. a. p.
By sale of dairy produce	...		...	8,607 6 9	Concentrated food	...	...		...	4,956 12 0
Dairy produce used for—					Fodder	...	...		...	1,602 8 0
Calf feeding ...	...	Rs.	1,186 11 4		Milk used by calves	...	...		...	1,186 11 4
Experimental work ...	...	,,	103 15 7	1,290 10 11	Establishment—					
					Permanent	...	...	Rs.	1,308 9 5	
					Variable	...	...	,,	1,049 1 9	
By transfer of animals	...		...	1,025 0 0						2,357 11 2
By sale of animals and calves	...		..	976 0 0	Recurring expenditure	...	...		...	1,467 14 0
By increased value of young stock	...		...	635 0 0	Depreciation—					
value of manure	...		..	600 0 0	On Buildings	...	@ 6 %	Rs.	471 15 9	
Separated milk unvalued	...		...	5 1 4	On Outfit	...	@ 5 %	,,	419 11 9	
					On Stock	...	@ 12 %	,,	402 14 6	
		Total	...	13,140 3 0					Total ...	1,294 9 0
										12,866 1 6
					Returns ...		Rs. 13,140 3 0			
					Expenditure ...		,, 12,866 1 6			
					Net profit		Rs. 274 1 6			

APPENDIX II.

Months.	Whole milk.						Cream.					Separated milk.					Butter.			Ghee.		Cheese.		
	Receipt.	Sales.	Fed.	Experimental use.	For cheese.	Separated.	Got.	Sold.	Experimental use.	For cheese.	For butter.	Got.	Sold.	Fed.	Dairy use.	Unvalued.	Made.	Sold.	For ghee.	Made.	Sold.	Made.	Sold.	Experimental and unvalued.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
April ..	6,283-8	2,717-8	36-0	37-0	...	3,503-0	489-6	18-14	...	...	470-8	2,979-0	907-8	2,019-0	36-8	16-0	254-4	264-12	...	...	0-8	...	...	...
May ..	5,231-8	2,456-8	122-0	49-0	...	2,604-0	361-6	11-14	...	...	349-8	2,883-0	613-8	1,553-0	52-8	4-0	192-4	135-0	57-4	44-12	23-0	...	...	...
June ..	4,680-0	2,223-0	489-0	56-0	...	1,906-0	292-8	7-14	...	...	284-10	5,586-0	643-0	893-0	45-0	6-0	157-0	149-8	...	...	19-0	...	...	...
July ..	4,725-8	2,643-0	359-0	20-8	...	1,703-0	262-0	5-14	...	...	256-2	1,469-0	499-0	883-0	27-0	...	141-12	141-4	...	...	...	...	...	...
August ...	4,599-0	2,713-8	578-0	3-8	...	1,310-0	203-6	6-12	...	...	195-10	1,068-0	298-8	755-0	20-8	...	119-0	115-0	...	...	...	...	...	...
September ...	4,980-0	2,776-8	502-0	...	...	1,701-8	252-8	13-3	...	...	238-15	1,488-0	398-0	1,005-0	25-0	...	140-4	125-12	4-0	3-0	3-0	...	...	...
October ...	6,098-0	2,883-8	758-0	6-0	...	2,450-8	377-12	8-5	...	...	369-7	2,046-0	758-0	1,255-0	33-0	...	178-8	161-12	40-0	25-0	24-8	...	...	...
November ..	6,562-0	3,185-8	440-0	17-0	...	2,921-8	452-3	20-12	...	...	431-7	2,435-0	694-8	1,694-0	34-8	12-0	251-12	1-2-12	37-0	28-8	23-0	...	...	...
December ...	8,433-0	3,639-8	720-0	8-8	200-0	3,865-0	568-0	23-7	25-0	...	549-9	3,208-0	991-0	2,121-0	46-0	50-0	277-0	246-8	46-0	35-8	38-8	137-0	106-0	3-0
January ..	7,541-8	4,199-0	258-0	9-0	...	3,075-8	473-5	60-3	...	...	413-2	2,568-0	968-0	1,562-0	38-0	10-0	232-4	231-0	23-0	19-8	19-8	80-0	84-0	85-0
February ..	6,785-0	3,783-0	210-0	72-0	8-0	2,644-0	408-15	31-14	4-2	9-0	363-15	2,814-0	738-0	1,447-0	2 -0	2 0	214-0	155-12	...	...	...	40-8	40-8	...
March ..	5,736-0	3,583-8	191-0	13-0	...	1,938-8	286-10	32-12	...	...	253-14	1,609-0	653-0	902-0	32-0	22 0	161-8	173-12	...	...	..	...	...	...
Total ...	71,589-0	36,808-0	4,647-0	291-8	220-0	29,622-8	4,456-9	241-12	29 2	9-0	4,176-11	34,767-0	8,149-0	16,089-0	407-0	132-0	2,2,9-8	2,102-12	207-4	156-4	151-0	197-8	170-8	27-0

NOTE.—The above figures are in lbs.

APPENDIX III.

Cows.

Serial No.	Brand No.	Name.	Lbs. of milk in the lactation period.	Lbs. of milk per day in the lactation period.	Lbs. of milk from 1st April to 31st March (1919 to 1920.)	Lbs. of milk per day in the year.	No. of days under observation.	Lbs. of milk during the whole of the observation period.	Remarks.
1	2	3	4	5	6	7	8	9	10
1	6	Ganga ..	2,434	8·8	2,434	6·66	1,994	11,179·5	Incomplete lactation period.
2	7	Narbada ..	1,049·8	10·49	1,701·8	4·66	1,987	11,021·5	Do. do.
3	9	Lakki ..	3,268	10·81	3,268	8·96	1,625	12,178	Do. do.
4	10	Laonga ...	47·5	·97	47·5	·12	1,552	5,325·5	Dried due to the death of calf.
5	14	Bhivry ..	1,407·5	6·9	599	1·64	1,768	5,437	Do. do.
6	46	Kosi ..	2,148·5	11·5	2,401	6 57	1,085	6,435	Incomplete lactation period.
7	21	Saraswati ...	1,993	6·49	2,001	5·38	715	4,343·5	Do. do.
8	22	Triveni .	1,498·5	9·19	1,974·5	5·40	496	3,227	Do. do.
9	40	Mary ..	3,188	13·33	3,188	8·73	239	3,188	Do. do.
10	45	Doris ..	3,161·5	16·03	2,161·5	5·92	136	2,161·5	Do. do.
11	25	Subhadra ...	876·5	7·62	876·5	2·40	115	876·5	Do. do.
12	51	Sarji ...	214·5	6·1	214·5	·59	35	214·5	Do. do.

APPENDIX IV.

Buffaloes.

Serial No.	Brand number.	Name.	Lbs. of milk in the lactation period.	Lbs. of milk per day in the lactation period.	Lbs. of milk from 1st April 1919 to 31st March 1920.	Average per day.	Amount of fat per cent in the lactation period.	Lbs. of fat produced in lactation period.	Lbs. of butter made during lactation period.	Number of days under observation	Lbs of milk since introduced.	Remarks.
1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	Ledi ...	4,085	15·1	3,546	9·6	7·2	296·36	347·7	2,926	30,099	Incomplete.
2	4	Gaora ...	5.285	12·2	2,858·5	7·8	6·4	341·87	396·5	2,263	27,495	
3	3	Maina .	3.110·5	12·7	3,124	8·4	7·7	240·27	278·7	2.925	24,302	Incomplete.
4	9	Geomar ...	3,110·5	9·2	3,021	8·2	8·1	253·96	294·5	1,992	16,268	Incomplete.
5	16	Barki ..	2,733	10	2,269·5	6·2	7·9	217·83	252·6	1,339	8,633	
6	20	Mukti ..	2,592·5	7	1,852·5	5	8	209·8	242·2	1,346	7,281	
7	24	Rukmi .	2,851·5	10·1	2,851·5	7·8	7·8	216·95	251·6	1,164	8,577·5	
8	28	Zanka ...	3,557·5	13·7	4,028	11·5	6·8	293·73	282·72	1,053	10,259	Incomplete.
9	22	Paijan ..	2,203·5	7·4	1,526	4	7·4	164·3	190·5	601	3,529	
10	25	Godawari ..	1,837·5	6·5	138	·3	7	127·54	147·9	...	1,837·5	
11	97	Mandodary ..	3,298	7·6	3,298	9	8·3	252	292·3	429	3,764	
12	98	Munia ..	2,345·5	9·1	1,609	4·4	7·3	172·2	199·7	256	236·0	
13	99	Domi ...	3,672	9·3	2,764	7·5	7·9	294·16	339·3	396	3,686·5	
14	100	Halkar ...	3,001·5	8·8	2,352	6·4	7·7	233·3	270·6	339	3,001·5	
15	17	Nagina ...	3,181	11·1	2,311·5	6·2	8	255·95	296·9	1,339	9,690·5	Incomplete.
16	101	Somi ...	1,837·5	8·09	1,887·5	5·2	7·8	148·3	192·0	228	1,887·5	
17	26	Rummal ...	1,457	12·5	1,457	4·1	7·2	106·03	112·9	116	1,452	Incomplete.

APPENDIX V.

Name of produce.	1914-15.	1915-16.	1916-17.	1917-18.	1918-19.	1919-20.	Remarks.
1	2	3	4	4	6	7	8
	Lbs.	Lbs.	Lbs. oz.	Lbs. oz.	Lbs. oz.	Lbs. oz.	
Whole milk from the herd	48,622	56,732	66,819 ½	79,554 8	75,814 0	71,589 0	
Whole milk sales	20,033	21,377	23,360 8	27,863 0	34,096 0	36,808 0	
Cream obtained	4,343	5,142	6,006 10	6,510 9	5,322 0	4,457 9	
Cream sales	165	144	118 3	209 4	335 13	242 12	
Butter produced	2,311	2,563	2,859 4	2,925 0	2,540 0	2,299 10	
Butter sales	2,000	2,294	2,784 4	2,798 0	2,426 8	2,105 12	
Ghee made	250	211	45 10	76 8	109 14	156 4	
Ghee sales	256	211	45 10	75 0	109 0	151 0	
Separated milk got	21,800	28,298	32,303 0	32,860 0	29,945 0	24,767 0	
Separated milk sales	14,522	18,404	17,575 0	20,037 0	12,768 0	8,149 0	
Separated milk fed	6,200	7,277	12 408 0	9,912 0	16,032 8	16,089 0	
Cheese made	...	...	340 0	765 0	154 0	197 8	
Cheese sales	...	...	340 0	765 0	149 0	170 8	
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Cash receipts from sales of Dairy Produce ..	4,234 0 0	4,668 12 6	5,326 1 9	6,297 4 0	7,144 4 6	8,607 6 9	

APPENDIX VI.

Comparative Inventory of the Dairy Stock.

Kind of Stock.	1914	1915	1916	1917	1918	1919	1920	Remarks.
1	2	3	4	5	6	7	8	9
Buffalo bull ...	...	1	1	1	3	1	1	
Milch buffaloes ...	10	12	12	20	21	22	17	
Buffaloes two years old and over. Male ...	1	1	2	2	1	...	3	
Buffaloes two years old and over. Female ...	1	5	6	4	13	16	21	
Yearlings ... Male ...	1	1	...	2	...	3	4	
Yearlings ... Female ...	7	2	4	9	3	6	7	
Calves ... Male ...	3	5	5	5	3	6	2	
Calves ... Female ...	3	4	8	8	8	9	6	
Total ...	26	31	28	51	52	73	61	
Calves born ..	8	11	13	15	19	23	15	
Cow-bulls ...	...	...	2	2	1	1	2	
Milch Cows ...	5	8	9	12	16	13	14	
Two years old and over. Male ...	2	1	1	2	2	2	1+5	
Two years old and over. Female ...	1	5	10	6	7	10+2	7+3	
Yearlings ... Male ...	2	1	2	2	6	2+5	3	
Yearlings ... Female ...	6	3	3	8	6	3	1+3	
Calves ... Male ...	1	1	1	6	7	5	1+2	
Calves ... Female ...	1	4	2	4	2	1+4	9	
Total ...	18	23	30	42	47	48	51	
Calves born ...	4	7	6	12	11	13	16	
Grand Total. ...	44	54	58	93	99	121	112	

APPENDIX.

GLOSSARY.

Botanical, English and Vernacular names of Crops, etc.

Botanical.	English.	Vernacular.
Cereals.		
Triticum sativum ...	Wheat ...	Gehu, gahu.
Andropogon Sorghum var. vulgare ...	Great millet ...	Juar (jowar).
Oryza sativa ...	Rice ...	Dhan.
Zea mais ...	Maize ...	Makka, makai.
Pasoalum scrobiculatum ..	(None) ...	Kodon.
Panicum psilopodium ...	(None) ...	Kutki.
Pennisetum typhoideum ...	Bulrush millet ...	Bajra.
Fodder crops.		
Sorghum amber ...	Sorghum ...	*Nil.*
„ collier ...	...	
„ sundia ...	..	
Trifolium alexandrium ...	Berseem ...	*Nil.*
Fibre plants.		
Gossypium neglectum ...	Jari cotton ...	Varadi Kativilayti.
„ indicum ...	Bani „ ...	Bani.
„ hirsutum ...	American cotton ...	Buri.
„ barbadense ...	Egyptian ...	*Nil.*
Crotolaria juncea ...	Bombay hemp ...	Sann.
Agave (varieties) ...	Aloe ...	Khekti.
Sisalana ...		
Vivipara ...		
Sahararpore ...		
Furcræa gigantea ...	Mauritius hemp ...	Khekti.
Corchorus capsularis ...	Low-lying jute ...	Pat.
C. olitorius ...	High-lying „ ...	
Hibiscus cannabinus ...	Dekkan hemp ...	Ambari, patwa.
Pulses.		
Cicer arietinum ...	Gram ...	Chana.
Cajanus indicus ...	Pigeon pea ...	Tur, arhar.
Dolichos lablab ...	Indian bean ...	Val.
„ biflorens ...	Horse gram ...	Kulthi.
Pisum arvense ...	Peas ...	Batra batana.
Lathyrus sativus ...	Chickling vetch ...	Lakh lakori, teora.
Ervum lens ...	Lentil ...	Masur.
Phaseolus mungo ...	Green gram ..	Mung.
„ radiatus ...	(None) ...	Urad.
Vigna catiang ...	(None) ...	Chauli, barbati.
Oilseeds.		
Linum usitatiss um ..	Linseed ...	Alsi, jawas.
Sesamum indicum ...	Sesamum ...	Til, tilli.
Carthamus tinctorious ..	Safflower ...	Kusum, kharad.
Ricinus communis ...	Castor ...	Andi, arandi.
Brassica juncea ...	Mustard ...	Sarson.
Arachis hypogœa ...	Groundnut ...	Mung-phalli, bhuimung.
Sugar.		
Saccharum officinarum ...	Sugarcane ...	Santa, us.
	Jaggery ...	Gur.
Vegetables.		
Ipomaea batatas ...	Sweet potato ...	Kand, shakharkand, ratala.
Trapa bispinosa ...	Water chestnut ...	Singhara.
Spices.		
Coriandrum sativum ...	Coriander ...	Dhania.

Botanical, English and Vernacular names of Crops, etc.—(Concld.)

Botanical.	English.	Vernacular.
Grasses.		
Saccharum spontaneum ...	*Nil* ...	Kans.
Andropogon punctatun ...	*Nil* ...	Kunda.
Cynodondactaylon ...	Couch grass ...	Dub.
Weeds.		
Cyperus searious ...	...	Nagarmotha.
Sesbania aculeata ..	...	Sawri.
Alysicarpus monilifer ..	...	Shevra.
Trees.		
Malia azadiraen ...	...	Nim.
Bassia latifolia ...	...	Mahus.
Terminalia tomentosa ...	...	Saj.
Silk.		
	Silk worm ...	Tassar.
	Castor silk worm ...	Eri.

Local agricultural terms—

Bakhar—A kind of blade harrow used as substitute for the plough and also for preparing the seed bed.

Biasi—The rice seed is sown broadcast and when the seedlings are about 9 inches high, the land is ploughed again at right angles to the direction of the furrows in which the crop was sown, the young seedlings being thus uprooted and thinned.

Lehi—Is the method of sowing broadcast with artificially germinated seed.

Birra—A mixed crop but usually refers specially to the wheat-gram mixture which is the common rabi crop of the northern districts.

Tifan—A drill plough.

Argada—A small weeding plough.

Kharbi—The stalks and leaves of *jwar* used as fodder.

Rabi—Crops sown in autumn and reaped at the end of the cold weather.

Kharif—Crops sown at the beginning and reaped at the end of the rains.

Kanhar—Dark clayey loam soil.

Wardi—Light sandy loam soil.

Morand—A soil similar to Kanhar but usually slightly lighter texture.

Utera—A second crop after rice, which is sown in the wet fields among the rice stems.

Kapas—Unginned cotton.

Bojha—A bag of unpressed cotton.

Ghi—Clarified butter.

Bari—A small garden.

Pulla—A bundle, usually of fodder.

Bhusa—Straw and chaff broken up together.

Khedda—An enclosure for the capture of game.

Datari—A log with wooden teeth fixed in it and used as a harrow.

Kopar—A log used for crushing clods.

Bir—An area reserved for the growing of grass.

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